Industrial QUALITY CONTROL

Vol. XII, No. 1
July, 1955

In This Issue

Some of the Challenging Questions In Statistical Control

The Role of Statistical Quality Control In Today's Chemical Company

Vendor Quality Practices in the Aircraft Industry

Simplified Procedures For Sampling Inspection By Variables

QUALITY
through
Scientific Methods

Journal of the
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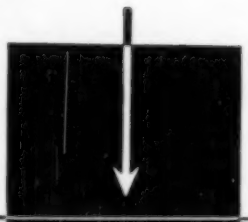
NUMBER THREE IN A SERIES

What's The Best Way To Gage These Parts ?

Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage



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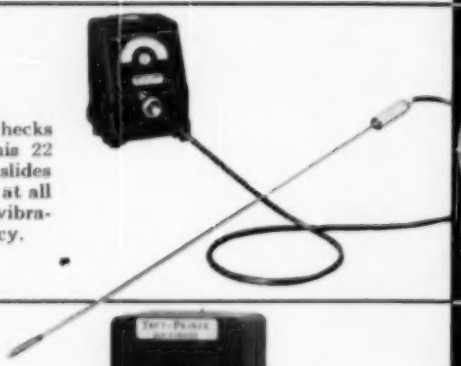

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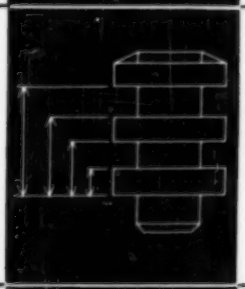

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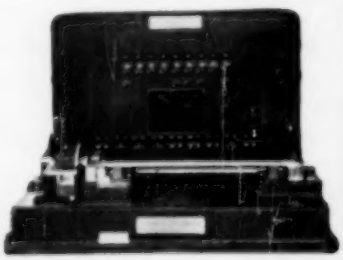

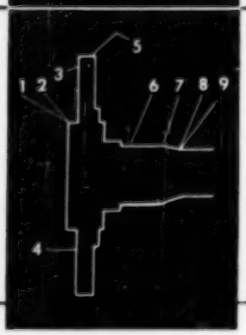

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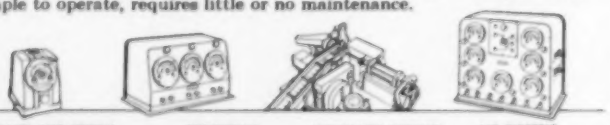

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He's "fingerprinting" a relay contact

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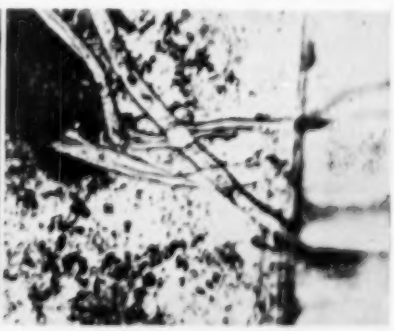
Using a portable test set, a chemist makes a plastic print of a contact. On-the-spot examination of the print with a microscope and chemical reagents quickly reveals the effects, if any, of arcing, friction, dust or corrosive vapors. While the chemist studies the print, urgently needed contacts continue in service. Findings point the way to improve relay performance.

This is another example of how Bell Telephone Laboratories research helps to keep your telephone system the world's best.

Above, Bell Laboratories microchemist applies plastic disc in heated clamp to relay contact. Imprint reveals contours of surface and picks up contaminants, if any. Part of portable test set is shown on table. Contacts, shown in small sketches, are of precious metal fused to base metal.

Preparing disc for microscopic examination. On-the-spot examination may reveal acid, alkali, sulfur, soot or other polluting agents peculiar to an area.

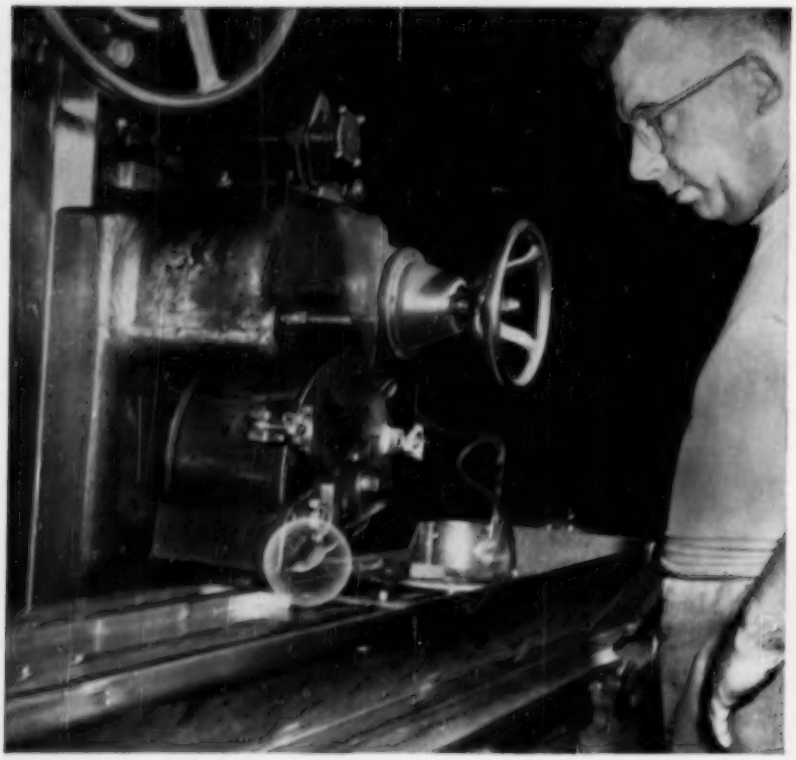
A microscopic look at disc often provides lead to nature of trouble. Unlike actual contact, print can be examined with transmitted light and high magnification.



Here the plastic disc has picked up microscopic lint that insulates contact, stops current. (Picture enlarged 200 times.) Traces of contaminants are identified in microgram quantities. Inert plastic resists test chemicals that would damage contact.

Bell Telephone Laboratories

Improving telephone service for America provides careers for creative men in scientific and technical fields



"Competitive wheels have never equalled G Bond wheels on our jobs." This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, extremely free cutting, requiring little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001".

Grinding precision spur gears of SAE 8620 steel, hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.

Jigs, fixtures and other parts of miscellaneous steels, besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.

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Industrial Quality Control

Vol. XII JULY, 1955 No. 1

Table of Contents

ARTICLES

Some of the Challenging Questions in Statistical Control
Edwin G. Olds 5

The Role of Statistical Quality Control In Today's Chemical Company
Maynard S. Renner 7

Vendor Quality Practices in the Aircraft Industry
David A. Hill 11

Simplified Procedures For Sampling Inspection By Variables
R. L. Storer & W. R. Davison 15

DEPARTMENTS

Report of the Ninth Annual Convention 18

Management's Corner
J. M. Juran, Editor 24

Bibliography
Joseph Movshin, Editor 26

Local Section News 29

What's New?
Roy Wylie, Editor 33

American Society News 38

Classified Ads 40

Consulting Services 40

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CHARLES DEERE WIMAN

With profound sorrow we record the death of our friend and member of the ASQC Advisory Council, Charles Deere Wiman, president of Deere & Company, on May 12, 1955, in Tucson, Arizona. His was that rare quality of leadership characterized by sincere respect and active consideration for the opinions of those associated with him, and a wholehearted recognition of the inherent worth and integrity of the individual. This capacity for generating a team spirit among his associates extended beyond the dynamic organization he built within his company to the many activities to which he gave his attention in public and community life. As an executive he had a superlative talent for delegating responsibilities which freed him from preoccupation with pressing details and which thus permitted him to devote his full energies to the planning and accomplishment of long-range objectives.

Col. Wiman participated actively in the formation of the American Society for Quality Control and had served on its Advisory Council since its formation. He was the principal speaker at a luncheon of the Third Midwest Conference and Second Annual Convention of ASQC in Chicago in November 1948 where he addressed a capacity audience in the Grand Ballroom of the Sherman Hotel on the subject, "Quality Control Stimulates Thinking." (IQC. Vol. V, No. 4, January 1949) He was a staunch advocate of the principles of quality control by statistical methods, not only for Deere & Company, but as a management concept generally. Within the company his emphasis was unswervingly on product design and efficient production. His achievement in promoting the integration of these two key areas of engineering activity through a strong and effective quality control program in the Deere organization is well known to all familiar with the history of successful applications of SQC.

But ASQC and Deere & Company are not alone among those who will feel the loss of Col. Wiman. His interests were broad and far ranging. At the time of his death, Colonel Wiman held directorships in the Continental Illinois National Bank and Trust Company of Chicago; the Chicago, Rock Island & Pacific Railroad; the Hilton Hotels Corporation; and the Protection Mutual Insurance Company. He also held membership in various clubs in Chicago, New York, and Los Angeles. Through the years Colonel Wiman actively engaged in committee work for the United States Chamber of Commerce. In 1932 and 1933 he headed the Farm Equipment Institute and in later years was a director of the Illinois Manufacturers' Association, as well as the Army Ordnance Association.

Charles Deere Wiman was born in the Borough of Richmond, Staten Island, New York, on February 11, 1892, the son of William Dwight and Anna Caroline Deere Wiman. His mother was a daughter of Charles H. Deere, only son of John Deere. Mr. Wiman married Pattie Harris Southall in Huntsville, Alabama, April 12, 1920 and, though they divided their time between Moline and residences in other parts of the country, their permanent home always was in Moline. Shortly before the United States entered World War I, Mr. Wiman left his job, enlisted in the Regular Army, and served for eleven months with the Sixth Division of the AEF. In October of 1919, he rejoined Deere & Company and in 1928 became president, a position he held until June, 1942, when he resigned to accept commission in the Ordnance Department. He was commissioned a colonel and assigned to the office of Chief of Ordnance, War Department, Washington. Later he became deputy of tank production of the Ordnance Department and was awarded the Legion of Merit for outstanding service during World War II. Late in 1944 Colonel Wiman returned to Moline and was again elected president of Deere & Company, a post which he held until his death. Surviving are his widow and two daughters, Mrs. Patricia Deere Wiman Hewitt and Mrs. Mary Jane Deere Wiman Brinton.

Col. Wiman leaves a vacancy but not a vacuum. He was a firm believer in and practitioner of the philosophy that whereas no one man is indispensable, the team is everything. In all areas that felt the influence of his personality the sense of loss will be that of having lost a magnificent teammate.

—FH

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Some of the Challenging Questions In Statistical Control

EDWIN G. OLDS

Carnegie Institute of Technology, Pittsburgh, Pa.

President Robert, General Simon, Ladies and Gentlemen:

It is a great honor to be included in the distinguished group of Shewhart Medalists and I am deeply conscious of that honor. I am very grateful to Major General Simon and the members of his Committee for their action in selecting me as the recipient of the Shewhart Medal and I appreciate the kindness of the Executive Committee and the Membership of the American Society for Quality Control in endorsing that action.

When I was notified that I was to receive the Shewhart Medal, I was given the opportunity to speak for not more than twenty minutes on a subject of my choice. For reasons which I shall indicate, I have decided to ask you to think with me regarding "Some of the Challenging Questions in Statistical Control."

Perhaps my first introduction to the ideas of statistical quality control came from the reading of a paper by Walter Shewhart in the May, 1931, issue of the *American Mathematical Monthly*. This paper, entitled "Random Sampling," was "presented at the invitation of the program committee of the Mathematical Association of America at its meeting at Brown University, Providence, Rhode Island, September 8, 1930." Dr. Shewhart's presentation of the "universal need for sampling theory" thrilled me. His statement that "The standard qualities of the things we make and the things we eat to sustain life are frequency distributions" opened my eyes to new vistas. His exposition of the way in which statistical principles could be used in approaching the quality control problem filled me with amazement.

A little later, when I read his *"Economic Control of Quality of Manufactured Product,"* my belief in the wisdom of Walter Shewhart's philosophy was strengthened. At that time I began to perceive some of the challenging questions which arise when actions in support of that belief are attempted. Over the years, this list has expanded.

The questions, that I shall pose, may not be new ones. Most of you have recognized the existence of the problems they represent and have made some contribution to their solution. I think that you will agree, however, that the problems have not been completely solved and that there is a need for combined effort in finding the best answers. In general, I shall make no attempt to answer the questions, in the time at my disposal. Rather, I shall be content to leave them with you for your deliberation. To take time for reflection on them seems not a luxury but almost a necessity.

Questions seem to fall in four areas; philosophical, technical, educational, and organizational. The answers to the questions in any one area affect answers to questions in other areas; and, in turn, are affected by them.

The philosophical question,

"What is statistical quality control?"

has been answered by stating that it is the application of statistical principles and methods in the improvement of the manufacturing operation. This answer may be satisfactory if we can accurately define the manufacturing operation and can state what is meant by improvement and can indicate precisely how statistical principles are to be applied.

The 1954 Shewhart Medalist
Edwin G. Olds

The use of statistical methods implies collection of data. We face the question,

"Why do people collect data?"

(Did you ever stop to carefully consider this question?) Probably people believe that knowledge of the past will help in predicting the future. Yet they recognize that change has been the basic characteristic of our physical state. The hope remains, however, that, if the causes for past effects can be isolated, then the future can be conditioned according to plan. And, even if causes cannot be identified, perhaps they will persist and allow short-term extrapolation. Such reasoning, however, seems to be based on a philosophy of strict determinism, but as Vannevar Bush remarks, in a paper on "Science and Progress?" (*American Scientist*, April, 1955, p. 247), "We have come generally to question whether there can be any scientific certainty."

Whether or not we forsake tradition in this fashion, we have found it satisfactory to adopt the statistical view point with respect to industrial data. To quote one of my students, "We should emphasize the importance of statistical philosophy in quality control, over and above statistical techniques and methodology." Those who wish to divorce the "statistical" from "statistical quality control" would do well to ponder what alternative philosophy is to be substituted.

It seems to me that the philosophy of statistical quality control rests on the assumption that the collected data constitute a sample, and that, on the basis of the sample,

some useful decision can be made regarding the character of the data source, together with a companion decision regarding preferable action on the source. In order to make this statement more precise we seem compelled to consider some questions in the technical area.

A simple example of an industrial process is one which has been producing one unit each minute for the last week and is expected to produce one unit each minute for the next week. We may ask

1) What statistical model is appropriate to describe the process for the past week?

2) Under the hypothesis of control, what model is appropriate?

3) What is the best way to collect and use the data in order to decide (a) the question of control? (b) the question of disposition of the product made during the past week?

4) What statistical model is appropriate to describe the product for next week?

5) How should data be collected and used in order to test the accuracy of the prediction?

The above set are only a few of the many statistical questions which can be asked. They are not very different from the questions which the statistician is trying to answer for workers in other fields. In my paper tomorrow afternoon, I shall return to this matter and hope to clarify it.

At this time I wish to raise one question about the formation of technical divisions in A.S.Q.C. I recognize the desires of the chemical people to associate with other chemical people, likewise for the metals people—and the aircraft men—and the representatives of all of the other divisions into which we seem to be separating.

I know the argument because I have heard it so often in the beginning. In every O.P.R.D. course in 1943-1945, there were people who told me,

"Our problems are different."

But I ask the question of you:

Are the *statistical* problems different?

What about the statistical philosophy, which distinguishes statistical quality control from the quality control we have had for a hundred years? Is the statistical philosophy different in automotive than in textiles, in electronics than in paper?

Are the statistical principles different?

I believe not!

To me, the essential unity of statistical problems is surprising. When it is recognized, then the disadvantages of isolation become most apparent.

Two connected questions then arise:

1) How can we increase the cooperation between statistical workers in the various fields (both within and outside A.S.Q.C.)?

2) How can we narrow the time gap between the development of basic theory and its application to our problems?

It is not unusual to hear a quality control engineer state that he is not a statistician. It is immaterial as to whether this statement is made as an apology or as an indication of superiority. In either case it carries the implication that he cannot understand much that the statistician has to offer unless there is some intermediary who will serve as an interpreter. Since good interpreters are not abundant, we must make a studied effort to accelerate communication by an increase in mutual understanding and respect.

At this point, I beg to digress long enough to remark that communication is hampered, also, by lack of agreement on notation. We must cooperate in the removal of this handicap.

While I am off my direct path, I should like to interject a word regarding the difficulty in finding enough young men to educate as topflight interpreters. Through your personnel men you are placing orders for young scientists with comprehensive education in mathematical statistics and statistical quality control, together with a firm foundation in basic science and engineering. It takes at least three full years beyond the bachelor's degree to educate the men you want.

Our problem in the colleges is to get the graduate students to educate. We can begin to fill your needs if we can get the raw material, the men with first degrees who are willing to come back to graduate school to prepare themselves to fit the job descriptions some of you are writing. The central problem, now, in connection with this special education, is the problem of material. The important question is,

How can you, and I, and the other members of A.S.Q.C., help to solve it?

In the broad educational area, we have made progress. Ten years ago, when the support of the War Production Board and United States Office of Education was withdrawn, we wondered who would provide the intensive courses which the Office of Production Research and Development had been sponsoring. Plans were made which helped to answer this challenging question and the contribution of universities and other organizations in giving intensive courses is well known. Training by local sections and at national meetings has been helpful. Evening courses have supplied some education at various levels. Our official journal, *Industrial Quality Control*, now publishes papers on fundamental developments, as well as reports of standard applications.

There are two questions, however, which seem to require especial attention.

1) How can scientists and technicians in other fields be given an understanding of the principles basic to statistical quality control?

2) How can the members of the American Society for Quality Control be brought to a greater realization of their need for more education in the fundamentals of the allied subjects of probability, statistics, engineering and science?

One reason that statistical quality control, and statistics in general, has not established itself more rapidly as a necessary tool in industry is because it is an unknown territory to so many of the people who have the power of life or death over it. Another reason is because some methodologists do not have sufficient grasp of basic principles to present their case convincingly to other scientists.

In spite of the comments following my last two questions it should not be inferred that any ground is being lost. My impatience stems from some failure to grasp all opportunities. Actually, it is gratifying to note that statistical control has proven itself so thoroughly that many companies are much concerned with the question,

"What is the place of statistical quality control in the industrial organization?"

The answer to this question is closely associated, at present, with the other question.

"What is operations research and what should be its organizational status?"

Both statistical control and operations research draw much of their strength from cooperative efforts based on intelligent application of probability and statistics. Whether statistical quality control is to be a part of operations research, or operations research is to be an expected function of the statistical control group, is a decision soon to be made in many places. We, of the

American Society for Quality Control, must take a large measure of responsibility for the direction of this decision. How it will be made will depend, somewhat, on how broad and how deep statistical control is proving itself to be.

In my introductory remarks I mentioned that I was given an upper limit of twenty minutes for my medal address. I share your surprise and gratification that I am about to meet this specification.

I have terminated my list of questions. May I suggest that the challenges of these, and other similar questions of philosophy, technique, education, and organization can make our work in statistical control very stimulating. I am confident that you agree that the challenges are those which we are ready and eager to accept.

The Role of Statistical Quality Control In Today's Chemical Company

MAYNARD S. RENNER

Dewey and Almy Chemical Company

"Do you use statistical quality control methods in your testing work?" is a question I have asked in many chemical laboratories during the past several years. Surprisingly often the reply has been: "Well—we are interested in statistical quality control, we would like to be using it, but right now we aren't doing anything about it." Often the speaker adds, "one (or two or three) of our men took a night course in statistical quality control one (or two or three) years ago" or "we'd like to do something about it but somehow we never seem to get started."

This situation has always puzzled me. Arousing interest and creating desire is said to be the biggest part of selling. But here, interest has been aroused, desire created, but no sale made. Why? What is stopping it?

This paper deals with this problem. It discusses some of the reasons why people have trouble getting started using statistics; indicates a way to make a beginning; discusses some of the advantages of making a beginning; and discusses some revelant problems of specification and testing precision in the chemical industry. It is written, not by a statistician, but by a staff man who has been there himself.

Let's start by asking, "Why use statistical methods? Is there any good reason?" In today's economic climate the only concrete reason for a chemical company's using statistical methods should be to reduce overall operating costs—overall costs, not solely inspection costs or spoilage costs. Evaluation should, of course, not be short term, but rather in terms of the long view that chemical companies must use to stay in business. If using statistical methods will cut operating costs they should be used. If their use will add to operating costs, they shouldn't be used.

Now how can using statistics reduce overall operating costs? Statistics is purely a tool—a tool for making decisions. Using statistics can reduce overall operating costs only as it helps an organization to make decisions more economically, that is with less expenditure of manpower or equipment in the decision-making process; or to make decisions more precisely, and thus obtain a more efficient use of raw materials. But are statistical methods not being used because they don't do these things? I think not. Certainly some well-run chemical companies, with recognizedly astute management, are spending heavily on statistical programs. Rather, I think the difficulty comes from two other sources.

In the first place, chemistry itself, in industry, is a decision-making tool. As a simple example, we don't run an acid number on a sample to learn its acid number but to decide whether to accept or reject the lot it represents. Chemistry is not only a science-based tool, but is a very workable tool. Most of the tests used in our laboratories were developed without the help of statistics. Our company was built upon quality and has maintained an excellent reputation for high quality products by chemical methods alone, without using statistics until recently. In other words, it may help, but you don't need statistical methods to run a chemical company.

Furthermore, the use of chemistry alone as a decision-making tool often involves a way of thinking which is very different from the way of thinking of statistics. A chemist runs a test and gets a number. This number is often considered to be, or to stand for, a "true," or absolute value. The importance of precision or lack of precision may or may not be seen, but the number obtained from the test nevertheless has definite standing as a number—maybe not a very good number, but still the best obtainable with the time and equipment at hand. Often the real worth of the number never gets tested because it was obtained by the best method anyone could think of; therefore it is assumed to be the best number anyone could get under the circumstances.

Now this way of thinking, statistically unrealistic, is also, of course, completely incompatible with the ideas of statistics. It may be abhorrent to the statistician, but remember it can make statistics equally abhorrent to the chemist! Why should he fool around with a lot of complicated mathematics, maybe even repeat a test a couple of times—he already has his number!

This pattern of thinking is a part of the custom of many chemical laboratories, and the power of custom has been described by Ruth Benedict[1] as follows: "No man ever looks at the world with pristine eyes. He sees it edited by a definite set of customs and institutions and ways of thinking. Even in his philosophical probing he cannot go behind these stereotypes, his very concepts of the true and false will still have reference to his particular traditional customs."

Some recent developments in the field of sociology, psychology and anthropology also help to explain why this pattern of thinking should have developed such force. It is only by trying ideas out in action that a person can make the judgments that will let him find out if a given belief is an effective operating tool. Thus, we are told,[2] all of us build up an assumptive world of beliefs that we have tested in action and found to be workable. Now what happens to the chemist's belief that the value he finds is the one true value, when he tries it out? I think we all know the answer: it works—to the chemist's satisfaction—most of the time. Its accompanying by-products such as excessive re-checking, feelings of guilt when rejecting "conflicting" data, and the occasional faulty decision are accepted as necessary evils.

The answer here, in my opinion, is to communicate with the chemist, not in the language of statistics but rather in the chemist's own language —his data—to get across by continued repetition, illustration, and explanation that these items of data are not magic numbers, but rather samples out of one or more populations. The chemist does recognize that there is uncertainty in his results. He is interested and often grateful for the point of view that shows his items of data neither as discrepancies, nor as standard deviations, but rather as part of a continuous and often predictable whole.

This approach speaks a language the chemist can understand. It also develops a growing appreciation for, and understanding of, the idea that variation is to be expected in nature, and thus it may lead to an understanding of the concept of variability. An understanding of this concept is necessary not only for an appreciation of the need for statistical methods, but also for an appreciation of how and where to use statistical methods; where and how not to use them also. (Understanding this concept is a great safeguard against misuse of statistical procedures; of getting the cart before the horse; the statistical technique before the problem.)

The second difficulty in the way of introducing statistical methods into a chemical company is that the average man is not accustomed to think in the language of mathematics, unless the kind of work he is doing directly calls for mathematics. Again, it is a matter of customs and beliefs that have worked. Industrial problems must be solved in a hurry, usually can be solved by thinking a language of things, materials, and equipment. The result is that the average chemist who knows only too well how to take an average, reacts with complete bewilderment to as simple an expression as the description of an average in terms of a mathematical formula as follows:

$$\bar{X} = \frac{\sum_{i}^{n} X_i}{N}$$

One solution for this difficulty, possibly not the best one but at least a workable one, is to use very simple statistical methods. We have had good results for example with a control chart using control limits calculated from mean successive differences or "running ranges" as developed for the chemical industry by A. C. Bicking.[3,4,5] These charts, requiring only simple calculations, have proven most valuable, particularly for many of our uses where we have relatively few batches of many different products. The chemist first uses them to tell him how well specifications agree with what the process is actually doing, with sometimes surprising results. Later he may learn that the calculated control limits, if the process is reasonably stable, give him a workable set of numbers to use to describe the behavior of the process.

It is such experiences that provide a connecting link between abstractly knowing about variability and the actual testing by action which is needed to convert abstract knowledge into firm belief. Gradually there develops a point of view which is a more effective operating tool because it agrees more closely with reality than the point of view which tends to look upon each discrete value by itself. It also provides a way to use all the data—a prime rule in problem solving.[6] No one would think of throwing out a piece of process equipment after making only one batch in it, yet in handling testing data, all too often, without a control chart or other statistical tool, all past experience is lost sight of and only the immediate moment's results considered.

Thus it might be said that the role of statistical quality control in today's chemical company is a conservative role: To provide a means for examining and describing the discrete items of data of the immediate present in the light of the sum total of past and predictable future experience of the same kind of data.

Here the value is not so much in statistics as in what statistics does. Its greatest value may possibly be semantic: It provides a way to describe quality situations more completely and in objective rather than in emotional terms. It probably takes on some of the aspects and values of mathematizing as described by Korzybski[7] as follows: "Mathematizing represents a very simple and easy human activity because it deals with fictitious entities and we proceed by remembering. The structure of mathematics because of this oversimplicity, yet structural similarity with the external world, makes it possible for man to build verbal systems of remarkable validity."

Consider, for example, what happens when specifications are examined in the light of the statistical quality control concept that the specification is economically determined on a factual basis. What quality does the customer need? What quality can the supplier make? If a compromise is necessary, which compromise will give customer and supplier the most favorable costs? How much variation must be expected in the product? In answering these questions, a slow, often subtle, but great change in an organization's habitual pattern of thinking about quality occurs. Quality ceases to be a matter of unanswerable questions of opinion. Quality questions are stated more precisely, and precisely stated questions have the one great value that their answers are clearly indicated.[8] Quality becomes recognized as a basic economic problem in which the customer's use requirements, the vendor's process capability, and the variability of the process are the important controlling factors.

The first signs of a pay-off come in the form of tangible savings in material costs from more economic use of raw materials because of better quality decisions.

The simplest example is the oldest and applies to all products bought on a weight basis and sold on a volume basis — including packaged products sold on a fixed weight per package basis. Without control charts weight per unit (square yard or package) usually fluctuates more widely than with control charts. To maintain the required minimum level it is necessary to run at a high average. The use of control charts calls attention to the importance of weight variation and eventually reduces it so that the product can be made to the same minimum level but at a lower average value with

consequent saving in material cost. Also, of course, a more constant product is more desirable to the customer than a widely fluctuating product.

This kind of saving often requires long study or a change of equipment to obtain, and is too often overlooked. I think it is entirely correct to say that anyone who is selling a packaged product on a guaranteed weight per package basis in substantial amount and not using statistical quality control is pouring money down the drain.

Other gains also come with control charts. People begin to watch the charts and to ask what causes some of the quality fluctuations they see. Spoilage and rework are reduced. When content or proportion of product or active ingredient is the fluctuating quality characteristic, the attempt to explain and control it can, almost without effort, lead to increased yields and hence more cost reduction. We are today using control charts in only a limited way but already our savings have amounted to many thousands of dollars per year from this source, with indications of much more to come.

But material costs are not the biggest part of a company's expenses. One accountant estimates that in a typical chemical company, material costs may vary from 28 percent of total expenses,[9] for an unprofitable volume of business to 35 percent of total expenses for a normally profitable volume. Savings through the use of statistical quality control can be obtained in the other areas of expense also. One tangible and highly publicized source of such saving comes through reduced sampling and testing, or inspection costs. But there are great intangible savings also, largely because quality decisions can now be made more efficiently and more economically; and making decisions in today's growing companies, with their growing communication problems can cost money.

People on decision-making levels in a company—management, sales, research, engineering, quality control—don't punch job tickets. So you can't tell how many hours spent arguing over whose opinion is right are saved by letting the data do the talking: nor how many hours of lost effectiveness due to resentments, aggressions and hostilities arising from internal friction over conflicting opinions are saved by having the data in shape so that the right action is clearly indicated: nor how much increased organization effectiveness comes from the improved habits of thought that develop through making decisions from facts instead of opinions.

One of our products that was considered very troublesome a few years ago today is considered one of our most satisfactory. Simply plotting a control chart showed the process to be remarkably uniform, but definitely out of step with specification limits with respect to a major though non-critical quality characteristic. Study of the customer requirements showed that it would actually be desirable to change the specifications to agree with the process capability of the product. The change was made with a resultant marked improvement in our opinion of the product, and a saving of much time spent previously deciding what to do about "off-specification" batches.

One step or series of steps in the manufacture of many of our products, as with many chemical companies, is the process of "adjusting" to final characteristics. These adjustments of course, cost money, in time, manpower, and equipment. One of our laboratory heads in charge of this kind of work has succeeded in reducing the former average of 1.5 adjustments per batch to one adjustment per 10 batches largely as the result of the better perspective and improved judgments made available to him by the historical background of the control chart.

Specification meetings for products under control charts run quietly and amicably. Each process is within specifications or it is not. If it is not, then the choice must be made between changing the process to fit the specification or changing the specification to fit the process. One small group of products is recognized as varying more than is considered desirable. However, the variation is also recognized as being inherent in this particular process. So long as succeeding batches stay within the indicated process limits, nobody is going to be badly upset about it. In the meantime, the energy that would otherwise be diverted into questioning and deciding about each deviating batch as it occurred, can instead be given to completing the field testing of a new series of products which have less variability.

But it is important to remember that the approach described above is along plausible or what the mathematician calls heuristic lines of reasoning instead of along the airtight lines of reasoning of the concept of statistical quality control according to Shewhart. In many ways—in many places—in its many phases, the chemical industry is different from the discrete-piece industries and it would seem that often the plausible or heuristic approach is the only way to make a beginning.

For example many chemical products made in batches are not made very often, at least as compared with the many units of production of the discrete-piece industries. For such products it may be impossible ever to get the amount of data needed to establish the high degree of control or predictability implicit in the Shewhart concept of quality control. Thus, calculated control limits for many chemical processes, although accepted for working purposes as Shewhart limits, may be, in a strict sense, what Shewhart calls "Students Ranges."[10]

Chemical specifications may put less emphasis upon specific performance requirements than do discrete-piece industry specifications. Different customers', often the same customer's, use-requirements of material, equipment and process may vary widely. Sometimes no performance test other than actual use in production has been developed. In such cases the specifications may be written largely to give assurance by means of a number of chemical or physical tests that each batch will be the same as all previous batches.

Simons' comments regarding this general phase of the problem of assuring standard quality are worthy of note here:[11] "It is impossible to specify completely a definite series of operations which will certainly detect that a very simple product is not standard quality. Some of the quality characteristics are not capable of definite measurement and after all, there is a limit to detail. Hence, the specifications of the intended quality must be limited to some chosen or principal quality characteristics of the product."

At present most of our specifications are set on the basis of engineering judgment considering all available information about process capability and customer performance requirements. Often today specific data about the customer's needs is incomplete, hard to get. Sometimes the tolerance limits required for satisfactory performance have not yet been precisely determined; at other times the customer's process is not stable enough to jus-

tify setting tolerance limits—what is wanted is the vague characteristic often called "latitude."

Many of these problems will, in time, be worked out. As a step in this direction, we are doing more and more field sampling not only to learn more about the quality of our product in the field but also to get still more specific data about the relationship between performance in the customer's plant and testing characteristics.

In thinking about specifications we must think also about testing precision since basically today precision and process variability are the two elements that determine how wide the specification limits should be. In discussing this subject, Simon suggests,[12] "a general rule, which of course, is not universally applicable, is that the standard deviation of the instrument should not exceed one-half the standard deviation permissible in the overall measurement of the product." To illustrate this rule's soundness, he uses a right triangle with the short leg representing instrument variability (neglecting operator variability), the long leg representing process variability, and the hypotenuse, representing overall variability being twice the length of the short leg. Values are then respectively proportional to 1, $\sqrt{3}$ and 2.

Further shortening of the short leg (testing variability) will not have much effect upon the length of the hypotenuse and hence will not pay off very much in reduced overall variability of product.

Testing precision, obviously important in certain types of scientific work or in testing valuable materials, is frequently a neglected subject in ordinary industrial work. This neglect can and does cost money. Money can be spent over-refining test methods. Costly tests of doubtful reliability can be run to give results not good enough to justify the cost of the test; or wrong decisions can be made from such results; or communication difficulties can occur from conflicting results obtained from such tests. Finally, wide testing variability in a quality characteristic which is tied to material cost may cost money by requiring unnecessarily high averages.

Possibly the two most important problems in testing precision are getting to recognize that there is such a thing and that it can be measured. Unquestionably testing precision should be studied whenever a new test is set up. Usually it receives some general consideration under the heading of "reproducibility" but no attempt is made to get any quantitative measure of precision. Almost everyone knows of one or more sad occurrences that came about from unexpectedly large test (or sampling) variability.[13] Why—under what circumstances do these things happen? Certainly much has been written about sampling and testing variability in recent chemical literature. Chemists are very skilled at finding causes of variability in certain kinds of tests. What kinds of tests cause trouble? Do they have any common characteristics? In spite of comments in the literature, in my experience at least, chemists do a lot of specifying workable sampling procedures, when they know that a sampling problem exists. When do they get into trouble?

One thing is sure, the attention paid to testing precision and sampling variability varies directly with the amount of "feedback" involved. If the test is to be rechecked within a short time, the effect will be anticipated and more precision built into the test; any inconsistencies that are found will be "fed back" to the original tester right away—and at an energy level corresponding to the dollar or other values involved. If the "feedback" is missing, delayed, at a low energy level, or contains the large amount of error (noise) of a highly unprecise test, then wide testing variability may go unnoticed for a long time.

This consideration, of course, suggests the desirability of providing adequate "feedback" mechanisms for all testing procedures. Various types of mechanisms have been suggested, including standard samples and retesting of "blind" samples. In our company we have found that a "Quality Audit" program, in which monthly samples from our various plants around the world are sent to the Cambridge Research Laboratories and retested, has provided a workable "feedback" mechanism. It has actually given us a kind of communication network over which any quality problem is brought to light, considered, and solved. In this respect it has pointed up very much the same thing that I have tried to get across in this paper. Quality control is something more than specifications, testing precision, statistics, human relations, processes and equipment. Quality control contains all of these, but it may very well contain a still bigger, and as yet undescribed, philosophical concept, and our success in working with quality may well depend upon our breadth of vision.

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Vendor Quality Practices in the Aircraft Industry

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Major airframe programs can involve sub-contracting 50 percent of the plane's structure to the tune of 200 million dollars or more. This is in addition to the long inventory of electric motors, actuators, controls, servos, black boxes—either purchased or Government furnished—that the prime contractor must fit into his airframe; and the raw material, hardware and detail parts that feed his assembly lines. It is easy to see that the performance of vendors becomes vital to the manufacturer's program; his profit or his loss can depend on how skillfully he handles procurement. The basis of this paper is a poll of the manufacturers in this field taken in preparation for a discussion of the subject at a session sponsored by the Aircraft Technical Committee on the program of the Eighth Annual ASQC Convention in St. Louis, June, 1954.

A rather lengthy questionnaire was sent to 72 Quality Managers and Chief Inspectors. It asked about their current experiences, practices and problems in receiving inspection and vendor quality performance. Fifty answers were received—convincing evidence of interest in the subject.

The 50 answers include a large majority of the airframe and engine companies. The auxiliary equipment and electronic manufacturers are well represented. In compiling a report on the results, the geographically separate divisions of large companies were counted independently, since it was obvious that they had arrived at individual answers to the questions raised.

The questions were not only answered; many provided such interesting comments that most of this paper is based on the information received. In order to avoid any possible embarrassments, names of companies or individuals have been omitted, even though this does an injustice to the many who put real effort into providing valuable comments.

The quality men made it plain that their biggest problem was, "How do we improve vendor quality performance?" The cost of source and receiving inspection is in inverse ratio to this performance. The quality of their end products is strongly affected by it.

We asked their opinion on what caused rejections. The results are shown in Table I.

The lefthand side of Fig. 1 shows these results in histogram form.

The vendor's quality control system takes a beating in the answers to the question (g). Boners by his operators (e), and poor equipment (d) are close behind. This may point up the urgency for more vendor education, which will be mentioned later. While (a) and (b) are not in the top ranking, many companies recognized that they sometimes confused or frustrated their vendors' efforts to please them. A clue to getting rid of this problem came from one company, "Items (a), (b), (c) and (f) are not found to be contributing factors in rejections occurring in Receiving Inspection. This can be attributed to coordinated effort between Quality Control, Engineering, and the Materials Department. Design changes are coordinated with Change Control and the subcontractors before effectivities are listed. The Materials Department, as a matter of pol-

TABLE I

		Ranking Frequency 1 = most important cause, 2 next, etc.						
		1st	2nd	3rd	4th	5th	6th	7th
(a)	Inadequate or confusing design information	2	1	5	*16*	10	2	
(b)	Delays in getting design changes to vendors		4	7	7	*11*	7	2
(c)	Unauthorized personnel			1	1	4	8	7
(d)	Inadequate processes or equipment at the vendor	4	8	*16*	6	3	3	1
(e)	Errors by vendor's operators	11	*20*	7	1	5	1	
(f)	The policy of accepting the lowest bid	1	1	8	7	2	*4*	10
(g)	Lack of consistent inspection or quality control by the vendor	*29*	13	3	2			

TABLE II

		Ranking Frequency 1 = most effective aid, 2 next, etc.					
		1st	2nd	3rd	4th	5th	6th
(a)	Quality Surveys of the Vendor by the prime contractor	*17*	9	5	4	4	4
(b)	Manuals for vendor's use	3	4	5	4	10	14
(c)	Tooling and methods assistance from the prime contractor	5	6	12	*14*	7	
(d)	Source inspection by the prime contractor	8	4	2	5	9	12
(e)	Follow-up by Purchasing on repetitive rejections	6½	4	*11½*	10	7	3
(f)	Follow-up by Quality Control on repetitive rejections	8½	*18*	10½	7		

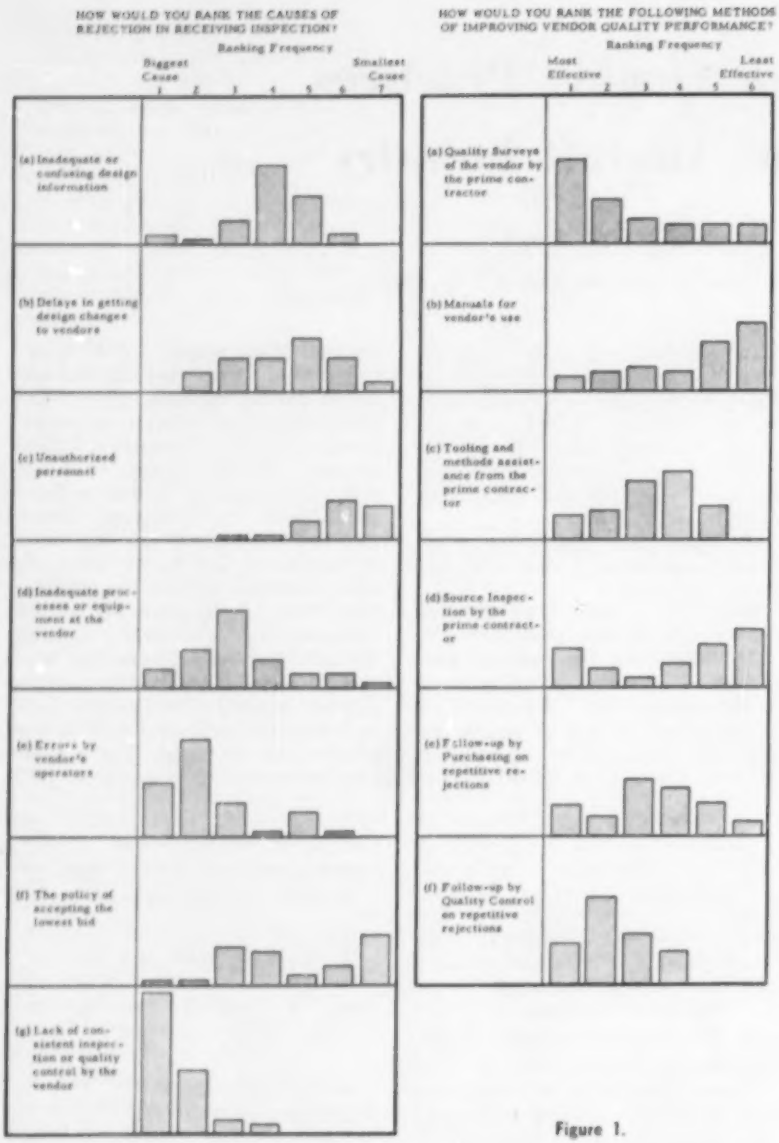

HOW WOULD YOU RANK THE CAUSES OF REJECTION IN RECEIVING INSPECTION?
Ranking Frequency
Biggest Cause
Smallest Cause
1 2 3 4 5 6 7
(a) Inadequate or confusing design information
(b) Delays in getting design changes to vendors
(c) Unauthorized personnel
(d) Inadequate processes or equipment at the vendor
(e) Errors by vendor's operators
(f) The policy of accepting the lowest bid
(g) Lack of consistent inspection or quality control by the vendor
HOW WOULD YOU RANK THE FOLLOWING METHODS OF IMPROVING VENDOR QUALITY PERFORMANCE?
Ranking Frequency
Most Effective
Least Effective
1 2 3 4 5 6
(a) Quality Surveys of the vendor by the prime contractor
(b) Manuals for vendor's use
(c) Tooling and methods assistance from the prime contractor
(d) Source inspection by the prime contractor
(e) Follow-up by Purchasing on repetitive rejections
(f) Follow-up by Quality Control on repetitive rejections

Figure 1.

icy, does not issue a Purchase Order unless this Purchase Order is screened by Quality Control and an actual Quality Survey of the Vendor is considered."

Some words got left out of (c) in the list of causes. It was meant to cover instructions to vendors by unauthorized personnel. If this had been clear, (c) might have been rated higher as a cause of trouble.

Well, what can the quality man do to get at the causes of rejection? We asked for a preference rating on a list of methods. The results are shown in Table II.

The right side of Figure 1 plots these answers.

Surveys of the vendor and reject follow-up by Quality Control come out ahead. Apparently we believe that, if a thing is to be done well, we had better do it ourselves. The places where one-half values show up resulted from advocating that Quality Control and Purchasing should get together on an approach to vendors. Purchasing follow-up and help with tooling are considered useful.

Notice the divided opinion about the value of source inspection. A separate question on the subject was, "How much value do you place on company source inspection?" The answers:

(a) Valuable for most purchased parts—reduces or eliminates rejections in receiving inspection..... 9
(b) Useful only for major sub-contracts 28
(c) Too expensive for results gained, to be avoided if possible 16

While the companies who use it widely are in the minority, the value they place on it is given by one comment, "We have been in the process of expanding our field quality control force for the purpose of source acceptance of those items which lend themselves to such a program. This philosophy has enabled us to obtain greater flexibility in our receiving inspection, at the same time permitting a minimum fixed within-plant receiving inspection force. It is our intention to further expand this concept because we feel it has numerous advantages . . . both for us directly and to the interest of the individual vendors."

Among those who restrict its use, one company lists the factors considered: "Source inspection is performed in the following cases:

1. High value product
2. Where process inspection is necessary
3. Special equipment required for inspection
4. Bulky items difficult to inspect upon receiving
5. Large volume of material."

Two companies have come to interesting conclusions about the approach to source inspection, "A surveillance inspection of the type indicated in MIL-5923A is probably the most that can be performed and still control the product without duplicating, augmenting, or replacing a vendor's inspection. The type of vendor who requires more than this will be expensive to the prime contractor and the product questionable at best. The source inspector is not in the position to have complete information, sufficient time, or be supplied with necessary engineering and tools to perform the required functional tests to assure a sound product. The vendor's tests would usually be followed without the assistance available at our plant. After all, the best and cheapest inspection is in the integrity and knowledge of the man actually doing the manufacture, processing, assembly, etc." and, "We do not use it except in rare cases on simple purchased parts. We send quality control engineers to our major suppliers to review their process operations and controls and send inspectors to the vendors' plants to inspect major items at source."

There are other ways to reach out beyond the factory receiving dock in an effort to increase the proportion of acceptable material. As one company puts it, "A very important factor which reflects upon the quality control of a vendor, is that of knowing the quality requirements of the prime contractor with whom he is dealing. Our experience indicates that both improved quality and better consumer-producer relationships are evident when there is available for vendor consumption, a specific detailing of the prime contractor's quality level requirements." We asked several questions in this field.

Have you negotiated purchase order agreements with vendors that include specified sampling plans to be used on shipments received?

(a) Done as a general practice.. 7
(b) Done in a few special cases.11
(c) Not done at all.....19

Do your vendors supply you with data from the inspections and tests they perform prior to shipment?

(a) Done as a general practice.. 5
(b) Done in a few special cases.40
(c) Not done at all..... 5

At present most of the data received covers chemical and physical tests, X-ray, Magnaflux and similar materials requirements. Some have arranged to receive functional test data to assist in tracking down the cause of trouble or to calibrate vendor test methods with those of the prime contractor. A desire to increase this practice was evident. Two comments are, "We heartily encourage data with the shipment from the vendor. This gives an immediate opportunity to check the measuring methods of the vendor vs. (this company). We have had only limited success in receiving this advance data," and "We have received from a few of our suppliers copies of lot plots, histograms, and process data, which is very helpful in performing inspections such as we do at this facility."

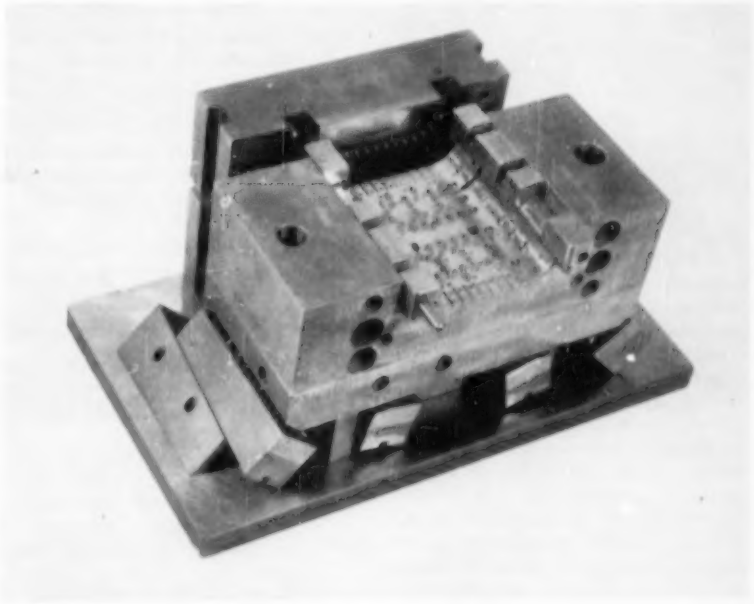
Have you developed mutually accepted inspection check lists with your vendors?

(a) Done as a general practice.. 5
(b) Done in a few special cases.25
(c) Not done at all.....15

This practice is not as widespread as check lists for internal use, but it is on the increase. The vendor may become aware of check lists through information returned with defects. Vendor-Contractor check lists came up in the sub-contracting of major air frame assemblies. For example, "(This company) does not coordinate each and every check list at the time it is organized. We do, however, provide applicable vendors with copies of these sheets on all parts with which they may supply us. Should there be any question as to the adequacy of the characteristics listed thereon, the check list will be considered for revision. Further, we hold periodic conferences with our suppliers, for the purpose of coordinating our inspection technique, acceptance criteria, and general policy."

Some work has also been done on vendor proprietary items, "Supplier representative and contractor liaison is very desirable when establishing check lists for vendor proprietary items. Check lists are generally established by Quality Control in conjunction with Engineering."

The quality men who answered the questionnaire frequently emphasized the need for personal contacts with the vendor. A typical statement was, "Our experience indicates the most effective method for getting corrective action is to work with the vendor at his plant, avoiding every possibility of misunderstanding, misinterpretation, etc., which can be created by remote communication." Most companies agreed that Purchasing has the primary responsibility for such con-



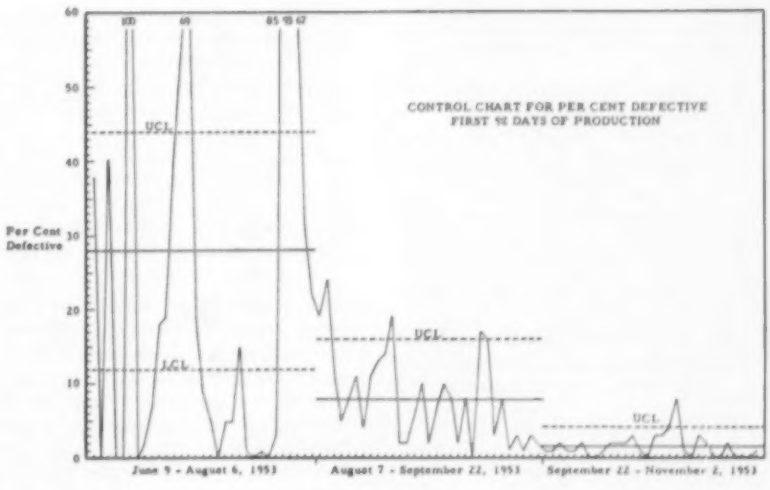


Figure 2

tacts. But the quality engineer can work with Purchasing, using a specialist's knowledge to untangle problems. If necessary, the tooling and methods experts should be brought into the picture. Figure 2 shows our early experience with a group of difficult molded parts. The part produced by the mold shown in the picture turned out to be an excellent barometer for the entire group. The assembled parts, together with numerous terminals, connections, clips and circuit components, form a vital sub-assembly in a flying electronic brain. Before we got rejections down to where we could live with them, we had to help the vendor with his tooling, his process controls, his instrumentation and his inspection methods. The chart is only a reflection of the intensive effort that was necessary.

A glance at the first month's results might suggest that we would have been smart to get in the door a little sooner. This brings up the idea of Quality Surveys of the vendor. The industry rated surveys very highly as a means of preventing trouble before it gets started. For example, from an airframe manufacturer, "Most important of all is a review of the job by the contractor from the point of view of planning, tooling and methods before the subcontract is placed." An electronics company agrees, "Field quality representatives who make the initial quality surveys of the vendor, often follow up to improve quality performance." And one company comments on the previous listing of methods for improving vendor quality, "Items (a) through (f) inclusive are all valuable instruments in obtaining corrective action, however, it is felt that the requirement for corrective action would necessarily be held to a minimum if the following steps are taken prior to issuing a Contract:

(a) Quality Surveys and approval of potential sources.

(b) Quality requirements stipulated on the Purchase Orders.

(c) Frequent Vendor and Contractor Representatives conferences to discuss Tooling and Engineering problems, methods of test, and inspections.

(d) An adequate system of vendor notification of rejections within the shortest possible time."

Personal contact with vendors is necessary if the prime contractor expects them to understand his use of statistical methods in receiving inspection. Suppose your vendor has come to count on the fact that you screen his shipments and return only defectives. One fine day the whole shipment lands back in his lap. It did not meet your sampling plan, based on a newly established AQL. He will soon be burning up the wires to your purchasing agent. If the vendor is one of those hard-to-find producers of technically difficult components, the purchasing agent is likely to be down on quality control for some time to come.

Our questionnaire asked how many had promoted the application of statistical quality control techniques with vendors. The answers:

Yes	26	Successfully	18
No	22	Unsuccessfully	2

About half the companies have tried this promotion. The results range from decided enthusiasm to modest hopefulness:

1. "We have conducted instruction courses and use our Vendor Quality Control Representative to continually promote the techniques of quality control with our vendors. They are very receptive. We have not, however, approached all of our vendors and believe that this is a field that should be explored more extensively."
2. "Promoted to a limited degree. Too early for evaluation of success."
3. "There is still a large group of small vendors who do not use SQC techniques and do not understand them. The larger vendors are rapidly becoming qualified in this field."

The hope was expressed that wider use of statistical quality control by vendors would result in reduced receiving inspection costs. One or two companies feel that the vendor can be allowed no leeway from the print requirements. Any discrepancies passed by his sampling techniques are subject to rejection and replacement. Others would dispute whether this policy is consistent with the Acceptable Quality Level concept the prime contractor often uses in his own operations. Absorbing a moderate percent of defectives may be less costly in the long run than a rigid policy on rejections.

In what ways, if any, did the companies find currently available statistical quality control techniques inadequate for use in receiving inspection? This will influence the extent to which we can promote the techniques with vendors. Table III gives the findings.

TABLE III

	Ranking Frequency (1 = most important objection, etc.)			
	1st	2nd	3rd	4th
(a) Too complicated, difficult to teach inspectors	3	4	4	5
(b) Useful only on long runs of a fixed design, not on short runs.	*16*	6	2	
(c) Too many risks involved for use on critical requirements.	6	*11*	4	
(d) Quality can be adequately controlled for less cost through spot checks by experienced inspectors.	5		3	6

Objection (b) crops up most often and most importantly. Category (c) might have bulked larger except several companies took the stand that statistical sampling is forbidden anyway on critical requirements. This is true in many specifications and regulations. Nevertheless, there are some military production programs on which critical requirements are handled by a very strict sampling plan.

One or two companies have remarked that 100 percent inspection does not necessarily mean 100 percent conformance. This has led to experimenting with variables acceptance techniques that try to keep the critical characteristic a safe margin away from the failure point. The Lot Plot plan can be used for this purpose and the Lot Template technique is promising.

Ten companies gave statistical quality control techniques a vote of confidence. They felt that none of the objections were serious if planning and training were adequate. Others who listed objections would probably agree with the statement made by one, "Normally we find existing Statistical Quality Control techniques adequate for use in Receiving Inspection. However, like most techniques used in Inspection they are subject to improvement. . . . We wish to stress that we do not feel that the deficiencies noted make

the techniques inadequate for use but are merely shortcomings which could stand improvement." Several also objected to spot checks as a substitute for statistical sampling as typified by the comment, "In general we find that we obtain better inspection which in the end results in less cost by using statistical control in lieu of spot checks."

We have been discussing the improvement of vendor quality performance. This assumes that the company has a fairly exact idea of how well the vendors are doing. The questionnaire asked about the means Quality Control used in reporting vendor performance. Is the report made to purchasing? To general management? Four of the 50 companies do no reporting and nine pass only routine information on to Purchasing. The majority make some kind of summary report for use by management as well as Purchasing. Some use percent of parts rejected and others percent of dollar value rejected. The range of reporting techniques is indicated by the following:

1. "Quarterly report from Accounting Department listing dollar value of shipments received by vendor plus dollar value of rejections, rework and scrap. These figures are worked out percentage-wise by Quality Control and control cards kept on each vendor and supplier. Report made to Purchasing and Management."
2. "Issue monthly a vendor list based on performance of last 30 days or ten lots."
3. "Monthly report of fraction defective in various categories of material is made by Receiving Inspection to Manager of Quality Control. This information is in turn incorporated in report to general management, manufacturing, purchasing, etc."
4. "Vendor quality performance on an individual basis is given periodic review in Receiving Inspection from vendor performance records and action taken where deemed necessary."
5. "A weekly report is made to Purchasing on vendor rejections. Further, a set of Statistical Quality Control charts on commodity rejection by quantity, type of error, etc., is provided Purchasing for buying coordination."
6. "Report is made as follows:
   (1) Graph by weeks—% of material referred to MRB
   (2) Graph by weeks—% of material reworked
   (3) IBM runs—results of each lot inspected, by vendor and part number including process average, size of lot, reason for rejection, etc.
   (4) Special reports on key vendors showing quality performance."

It appears that Quality Control in many companies has been doing some thinking about how to improve vendor quality performance. The tendency is to work more closely with Purchasing and Engineering. A sub-contract that starts out with a good understanding between these three departments has a better chance of coming out well. The modern techniques of Quality Control are getting a work-out. Some of the techniques are statistical, but many involve only a better organized appproach to the question of "what is wanted and how do we go about getting it?" We have developed methods that increase the efficiency of our trouble-shooting, but we are even more interested in how to prevent the trouble in the first place—or to catch it before it grows into a disaster. Most important, the effort is being made to bring the vendor into the act—to agree with him on the rules of the game, to keep him out of trouble, to recognize that his success is important to our own prosperity.

Simplified Procedures For Sampling Inspection By Variables

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INTRODUCTION

The *Manual of Procedures and Tables for Sampling Inspection by Variables*, prepared at the Ordnance Ammunition Command in August 1953, has now been adopted as an Ordnance Standard by the Office of Chief of Ordnance and designated the ORD-M608-10 Handbook.

Choice of the variables approach to sampling inspection has, in the past, been restricted by administrative difficulties. Problems related to training personnel and to processing measurement data often prompted inspection planning agencies to specify an attributes criterion even in test situations where a variables plan would operate more efficiently. While acknowledging the benefits available through inspection by variables, administrators are sensitive to resistance from line inspectors to procedures which involve arithmetic. (Resistance on this score is by no means limited to inspectors!) The authors take this opportunity to describe seven provisions established by the new Handbook which in large measure operate to overcome these objections.

CHECK LIST OF FEATURES OFFERED BY THE ORD-M608-10 HANDBOOK

1. Condensed, comprehensive tables.
2. Short-cut method for computing maximum allowable variation.
3. Range plan k values adjusted to eliminate division of R by d_2.
4. Parallel Range and Standard Deviation plans giving essentially equal protection for a given sample size.
5. Acceptance Criteria which permit a direct decision on lot acceptability.
6. Constant probability of accepting AQL product.
7. Two separate bases for choosing sample size.

DISCUSSION

Table R illustrates the condensed tabular form adopted in the Stand-

ard to eliminate needless page-flipping. The inspector finds here all the constants he needs to conduct variables sampling inspection under a Range plan. Accompanying instructions tell the inspector to enter the Table through Section 1 if sample size is determined by lot size. If considerations apart from lot size are used to determine sample size, the inspector enters Section 3 with a Category code letter assigned by inspection planning personnel. In either case he finds in Section 2 the k value (and *F* value for two-sided tests) corresponding to the AQL under which inspection is being conducted. A similar table for operating a Standard Deviation plan is also provided. (See Table S.)

F, shown in italic type beneath corresponding k values, is a factor employed in computing MAV, the Maximum Allowable Variation. The reader will recall that when two-sided testing is conducted under a pair of one-sided variables plans, as provided by the Handbook, a zone of error is created wherein lots which would be rejected by a unique two-sided plan are accepted. Such lots are characterized by a mean very close to the population mean and a relatively large standard deviation. MAV introduces a cut-off line approximately tangent to the maximum point of the two-sided acceptance region and thereby reduces to a minimum the zone of error mentioned above.

The general formula for MAV may be written

$$MAV = \frac{U - L}{D_U + D_L}$$

where U and L are the upper and lower specification limits applying to individual pieces, and D_U and D_L are terms associated with the AQL of each limit. Considering the most common situation where $D_U = D_L = D$, $D_U + D_L = 2D$.

For Range plans, $V = \overline{R}/2.3259$ and $MAV = \frac{U - L}{2D}$ By setting $\frac{2.3259}{2D} = F$, the equation can be simplified to read

$$MA\overline{R} = F(U - L).$$

Using a parallel argument, MAS (the Maximum Allowable Standard Deviation) equals $F(U - L)$ when we set $F = \frac{1}{2D}$. Obviously, Range plan *F* values differ from those used with Standard Deviation plans.

A similar device was employed to eliminate the division of $\overline{R}$ by d_2 in applying Range plan acceptance criteria. Stated in conventional form, the criterion for upper limits is

$$\overline{X} + k\frac{\overline{R}}{d_2} \leq U$$

which, in the new Handbook has been rearranged slightly to read

$$\overline{X} + \frac{k}{d_2}\overline{R} \leq U.$$

Range plan k values, adjusted to assure protection substantially identical to that given by Standard Deviation plans for a specified sample size, have been divided by $d_2 = 2.3259$ (for subgroups of five to obtain entries shown in Table R. These adjustments are discussed at some length in an OAC technical paper, ES Memo 401-0-8, which presents the rationale and mathematical development of variables plans established by the Handbook. No reference to the special nature of Range plan values is found in the Handbook itself.

Use of acceptance criteria related directly to the inspector's own work is retained in the new Ordnance Standard. The sample mean and a

TABLE R. MASTER TABLE FOR AVERAGE RANGE PLANS

SECTION 1					SECTION 2											SECTION 3		
LOT SIZE			SAMPLE SIZE	CONSTANTS	ACCEPTANCE CRITERIA CONSTANTS: RANGE PLANS (Note: *F*-values are used only in two-sided testing)											CONSTANTS	SAMPLE SIZE	CATEGORY OF INSPECTION
INSPECTION LEVEL					ACCEPTABLE QUALITY LEVEL													
I	II	III			.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50			
Less than 111	Less than 41		5	k *F*	.80 *.540*	.76 *.559*	.73 *.580*	.68 *.608*	.64 *.639*	.59 *.676*	.54 *.714*	.50 *.757*	.43 *.824*	.37 *.902*	.29 *1.012*	k *F*	5	A
111-180	41-110	Less than 41	10	k *F*	.93 *.481*	.89 *.499*	.85 *.517*	.80 *.542*	.75 *.569*	.69 *.601*	.64 *.635*	.59 *.673*	.52 *.730*	.46 *.798*	.37 *.891*	k *F*	10	B
181-300	111-180	41-110	15	k *F*	.99 *.456*	.95 *.472*	.91 *.489*	.85 *.513*	.80 *.538*	.75 *.569*	.69 *.601*	.64 *.636*	.57 *.690*	.50 *.754*	.42 *.840*	k *F*	15	C
301-500	181-300	111-180	20	k *F*	1.03 *.440*	.99 *.456*	.95 *.472*	.89 *.496*	.84 *.521*	.78 *.550*	.73 *.581*	.67 *.615*	.60 *.667*	.53 *.728*	.44 *.811*	k *F*	20	D
501-800	301-500	181-300	25	k *F*	1.06 *.430*	1.02 *.445*	.97 *.461*	.92 *.484*	.86 *.508*	.81 *.537*	.75 *.567*	.70 *.600*	.62 *.651*	.55 *.710*	.46 *.791*	k *F*	25	E
801-1300	501-800	301-500	30	k *F*	1.08 *.422*	1.04 *.438*	1.00 *.453*	.94 *.475*	.88 *.499*	.83 *.527*	.77 *.557*	.71 *.590*	.64 *.639*	.56 *.698*	.48 *.777*	k *F*	30	F
1301-3200	801-1300	501-800	35	k *F*	1.10 *.416*	1.06 *.431*	1.01 *.447*	.96 *.469*	.90 *.492*	.84 *.520*	.78 *.549*	.73 *.581*	.65 *.631*	.57 *.688*	.49 *.765*	k *F*	35	G
3201-8000	1301-3200	801-1300	40	k *F*	1.12 *.410*	1.07 *.426*	1.03 *.441*	.97 *.463*	.91 *.486*	.85 *.514*	.80 *.543*	.74 *.574*	.66 *.623*	.58 *.680*	.50 *.756*	k *F*	40	H
8001-22000	3201-8000	1301-3200	50	k *F*	1.14 *.404*	1.09 *.418*	1.05 *.435*	.99 *.454*	.93 *.478*	.87 *.505*	.81 *.533*	.76 *.564*	.68 *.612*	.60 *.668*	.51 *.743*	k *F*	50	I
22001-110,000	8001-22000	3201-8000	70	k *F*	1.17 *.394*	1.13 *.409*	1.08 *.423*	1.02 *.444*	.96 *.466*	.90 *.493*	.84 *.521*	.78 *.551*	.70 *.598*	.62 *.652*	.53 *.725*	k *F*	70	J
110,001 & Over	22001-110,000	8001-22000	130	k *F*	1.22 *.380*	1.17 *.394*	1.13 *.408*	1.07 *.429*	1.00 *.450*	.94 *.475*	.88 *.502*	.82 *.531*	.73 *.577*	.65 *.629*	.56 *.700*	k *F*	130	K
	110,001 & Over	22,001 & Over	200	k *F*	1.25 *.373*	1.20 *.386*	1.15 *.401*	1.09 *.420*	1.03 *.441*	.96 *.466*	.90 *.492*	.84 *.521*	.75 *.565*	.67 *.617*	.58 *.686*	k *F*	200	L

TABLE S. MASTER TABLE FOR STANDARD DEVIATION PLANS

SECTION 1					SECTION 2											SECTION 3		
LOT SIZE INSPECTION LEVEL			SAMPLE SIZE	CONSTANTS	ACCEPTANCE CRITERIA CONSTANTS: STANDARD DEVIATION PLANS (Note: *F*-values are used only in two-sided testing) ACCEPTABLE QUALITY LEVEL											CONSTANTS	SAMPLE SIZE	CATEGORY OF INSPECTION
I	II	III			.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50			
Less than 111	Less than 41		5	k	1.89	1.81	1.72	1.61	1.51	1.39	1.28	1.17	1.02	.86	.68	k	5	A
				F	.229	.238	.246	.259	.272	.288	.304	.323	.351	.386	.433	F		
111-180	41-110	Less than 41	10	k	2.21	2.12	2.03	1.90	1.79	1.66	1.54	1.41	1.25	1.08	.89	k	10	B
				F	.202	.210	.217	.228	.240	.254	.268	.284	.309	.338	.379	F		
181-300	111-180	41-110	15	k	2.37	2.27	2.17	2.04	1.92	1.78	1.66	1.53	1.36	1.19	.99	k	15	C
				F	.191	.198	.206	.216	.227	.240	.254	.269	.292	.319	.357	F		
301-500	181-300	111-180	20	k	2.46	2.36	2.27	2.13	2.00	1.86	1.74	1.61	1.43	1.25	1.05	k	20	D
				F	.185	.192	.198	.209	.219	.232	.245	.260	.282	.308	.344	F		
501-800	301-500	181-300	25	k	2.53	2.43	2.33	2.19	2.06	1.92	1.79	1.66	1.48	1.30	1.09	k	25	E
				F	.181	.187	.194	.204	.214	.227	.239	.254	.276	.301	.336	F		
801-1300	501-800	301-500	30	k	2.58	2.48	2.37	2.24	2.11	1.96	1.83	1.70	1.52	1.33	1.13	k	30	F
				F	.178	.184	.191	.200	.211	.223	.235	.249	.271	.296	.330	F		
1301-3200	801-1300	501-800	35	k	2.62	2.52	2.41	2.27	2.14	2.00	1.86	1.73	1.54	1.36	1.15	k	35	G
				F	.176	.182	.189	.198	.208	.220	.232	.246	.267	.292	.325	F		
3201-8000	1301-3200	801-1300	40	k	2.66	2.55	2.44	2.31	2.17	2.03	1.89	1.75	1.57	1.38	1.17	k	40	H
				F	.173	.180	.186	.195	.205	.217	.230	.243	.264	.289	.322	F		
8001-22000	3201-8000	1301-3200	50	k	2.71	2.60	2.49	2.35	2.22	2.07	1.93	1.79	1.61	1.42	1.21	k	50	I
				F	.171	.177	.183	.192	.202	.214	.226	.239	.260	.284	.316	F		
22001-110,000	8001-22000	3201-8000	70	k	2.78	2.67	2.56	2.42	2.28	2.13	1.99	1.85	1.66	1.47	1.25	k	70	J
				F	.167	.173	.179	.188	.198	.209	.221	.234	.254	.277	.309	F		
110, 001 & Over	22001-110,000	8001-22000	130	k	2.89	2.77	2.66	2.51	2.37	2.21	2.07	1.93	1.73	1.54	1.32	k	130	K
				F	.161	.167	.173	.182	.191	.202	.214	.226	.246	.268	.299	F		
	110,001 & Over	22,001 & Over	200	k	2.95	2.83	2.72	2.57	2.42	2.26	2.12	1.97	1.77	1.58	1.35	k	200	L
				F	.158	.164	.170	.179	.188	.199	.210	.222	.241	.263	.293	F		

measure of variability, computed for data collected by the inspector, are substituted without alteration in the inequalities

$$\bar{X} + kV \leq U$$

or

$$\bar{X} - kV \geq L.$$

This procedure places no artificial barrier between the inspector and his decision on lot acceptability. It is straightforward, easily understood, and lends itself readily to graphic presentation in training sessions.

By streamlining the clerical phase of the line inspector's assignment, features discussed in the foregoing paragraphs simplify the administration and reduce the cost of operating a variables sampling inspection plan. The two remaining features covered by this paper have little effect upon the inspector himself, but are of interest to personnel responsible for preparing standard inspection instructions.

Acceptable quality level (AQL) is defined in MIL-STD-105A as ". . . a nominal value expressed in terms of percent defective or defects per hundred units . . ." Whatever the assigned AQL may be in a particular situation, there are a number of different sample sizes which, together with their respective acceptance constants, fall into the specified AQL class. In this sense the AQL is often used as an index to a group of sampling plans whose severity, it is thought, tends to increase with increasing sample size.

Upon reflection it becomes clear that such an inference may not be valid if the probability of accepting AQL product varies from plan to plan within groups. This consideration becomes quite important when an effort is made to select the most efficient sampling plan on the basis of cost. The new Handbook provides a constant probability ($\simeq .95$) of accepting AQL material when submitted and thus eliminates problems which may arise in the absence of such provision.

Reference has already been made, in passing, to Section 3 of Table R which is used when sample size is chosen according to Category of Inspection. The category concept acknowledges that lot size may, in some instances, be largely irrelevant to a discussion of sample size. Factors such as the nature of the test, the unit value of product, availability of storage space, the sheer physical problem of drawing the sample, and the quality history of the item may far outweigh customary lot-size/sample-size considerations. With these factors in mind, the Handbook provides a means for determining sample size by an appropriate Category, selected by responsible inspection planning personnel to represent a given testing operation.

Compared to attributes sampling plans, the cost and relative difficulty of operating variables plans is somewhat greater. These impediments diminish in importance where it is desirable to minimize sample size without sacrificing protection against the acceptance of unsatisfactory product. This is a situation which commonly arises in the performance of destructive tests. Other applications are envisioned, however, where experience indicates that the variables approach offers a superior tool for inspecting a particular quality characteristic.

INSTRUCTIONS FOR USING THE MASTER TABLES

1. Table R and Table S contain all constants required by the inspector for operating a Variables Sampling Plan where $\bar{R}$, the average range, or s, the standard deviation

is used, respectively, as the measure of variability.

2. Section 1 will be used in conjunction with Section 2 for inspection situations where sample size is determined by lot size.

3. Section 3 will be used in conjunction with Section 2 when sample size is determined by factors other than lot size. In each such application, the responsible inspection planning agency will designate by code letter the Category of Inspection to be used.

4. Note that Section 2 is always used, regardless of the method by which sample size is determined. Also note that values of F are used only when testing under two-sided specification limits.

5. Acceptance Criteria:

(1) $\bar{X} + kV \leq U$

(2) $\bar{X} - kV \geq L$

(3) $F(U - L) \geq V$

Where V is the measure of variation ($\bar{R}$ or s)

In a one-sided test, apply either (1) or (2) but not (3).

In two-sided testing, apply (3) first, then apply both (1) and (2).

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REPORT OF THE NINTH ANNUAL CONVENTION

AMERICAN SOCIETY FOR QUALITY CONTROL

New York, New York, May 23, 24, 25, 1955

People must really be interested in Quality Control! Although New York City had three days of hot muggy weather, approximately 2250 delegates attended the 9th Annual ASQC Convention, May 23-25. The pleasant atmosphere of the Hotels Statler and New Yorker helped to make this weather bearable. Some lucky people even had air conditioners in their rooms, as well as TV sets! In spite of the poor cooperation of the weather man, everyone seemed to enjoy himself thoroughly.

Even though the Convention didn't officially start until Monday morning, May 23, many delegates arrived in time for early bird registration on Sunday. This helped to relieve the annual rush and crush of first day registrations. The registration Committee, for both Convention and Ladies' Registrations, very obligingly remained at their posts until long after the appointed closing time. A change in plans which made it possible to accept cash registrations on Sunday also helped to speed things up.

OPEN HOUSE

The invitation of the Metropolitan Section, ASQC, to attend an Open House on Sunday evening was accepted with alacrity by more than 300 people attending the Convention. The Penn Top of the Hotel Statler was just the right size for this informal gathering. The light refreshments were good, especially the bleu cheese and the coffee. The night view of the city from the terrace was a beautiful sight. Many of those present were renewing acquaintances with people they had met at previous conventions.

LADIES' PROGRAM

The Ladies' Program was a huge success. More than 200 women registered for the Ladies' Program, making it the largest of any ASQC Convention to date. The morning coffee hours were wonderful get-acquainted sessions, and tickets were available for radio and TV shows and for specific tours. The guided cruise around Manhattan Island on Monday afternoon gave the women an entirely different picture of Gotham than the impression they had received while in the heart of the city. The Ladies' Luncheon was held Tuesday noon at the Brass Rail Restaurant. Dr. Francis M. Dowd of Rutgers University, Department of Psychology, gave a lively, humorous, yet instructive talk on the different phases of psychology. He

was very well received and spent a full twenty minutes answering questions afterwards. This question period would have lasted much longer if the buses had not arrived to take the ladies to the United Nations Building for an afternoon tour. Wednesday afternoon featured a bus trip to China Town and lower Manhattan. Some local manufacturers gave the ladies samples of their products.

TECHNICAL SESSIONS

By Monday morning, May 23, well over 1000 registrants were ready to start the Convention officially. Basically there were eight simultaneous sessions presented each morning and afternoon for three days. The wide scope of industries represented, with statistical applications running the gamut from the simplest to the most advanced, was a favorable sign of the continuing growth of SQC. With this large variety of speakers and topics, many wished they could have been in two places at once.

LUNCHEONS

The speaker at the Chemical Division luncheon on Monday was William L. Gore, of E. I. duPont deNemours and Company. His subject, "The Contributions of Statistical Methods to Chemical Enterprises" was very well received. In fact, extra tables had to be set up to accommodate those wishing to hear his talk. At the same time, Albert E. Meder, Dean of Administration of Rutgers University, was toastmaster at the general luncheon at the Hotel Statler. On Tuesday, Dr. L. Grant Hector, Vice President in Charge of Technical Operations, Sonotone Corporation, spoke at the general luncheon. "The Management Yardstick for Measuring Quality Control Performance" was extremely interesting. At the same time, the Textile Division was presenting its own program to those attending the luncheon at the Hotel New Yorker. "Human Freedom and Foreign Policy" was the subject of Dr. Ralph C. Hutchison, President of Lafayette College. There was an interesting up-to-the-minute talk sponsored by the Metals Technical Committee at their luncheon Wednesday at the Hotel New Yorker. Simultaneously, Dr. Mason W. Gross, Provost, Rutgers University, discussed "Quality and Quantity in Higher Education." The prospect of education increasing numbers of college students by the 1960's was ably discussed by "the professor with a high TV rating."

ANNUAL BANQUET

The Annual ASQC banquet was held in the Grand Ballroom of the Hotel Statler on Tuesday evening, May 24. After the playing of our National Anthem, Paul Robert, president of ASQC, introduced the Reverend Arthur R. McKay, First Presbyterian Church of Binghamton, N. Y., who delivered the invocation.

Following his welcoming remarks, President Robert presented the Saddoris Award for Section Management to Donald F. Flanders, General Motors Corp., Chairman of the Indianapolis Section. Indianapolis was adjudged the winning section, with the Milwaukee Section being a close second.

Next was the presentation of the 1954 Brumbaugh Award to Dr. Daniel B. De Lury for his article entitled, "On the Design of Experiments," which appeared in the January 1954 issue of IQC.

President Robert then introduced Major General Leslie E. Simon who served as sponsor for the 1954 Shewhart Medalist. The text of General Simon's sponsoring remarks follows:

*Sponsor's Remarks on the Award of the Shewhart Medal to Professor Edwin G. Olds**

The Shewhart Medal was established by the directors of our Society in 1947 to serve a dual purpose. First, it is an enduring honor to our most distinguished fellow member, Dr. Walter A. Shewhart, whose genius brought forth a marked advance in science, a moral and material stimulus to professional engineers, and a most fruitful and effective tool for industry and for our general economy. Second, it serves as an annual honor to that person whom, within the limitations of our humble ability to judge, we believe to most nearly deserve an honor allied to that which we bestowed on Walter Shewhart. The award is designated for outstanding contributions to the cause of quality control, but by association with Shewhart surely implies emphasis on intellectual and creative ability that has enabled the recipient at least in small measure to advance the frontiers of science, emphasis on articulate sharing of the fruits of his work with fellow members who can benefit from them, and emphasis on human qualities of the true teacher that endear him to those who learn from him even though they only read his printed words.

Thus, the annual award of the Shewhart Medal is particularly significant in one respect. It is not an action to induce the person to serve us; it is not a *quid pro quo* for benefits received, since we regard it as small in magnitude compared with what the medalist has freely given; it is a kind of spontaneous outpouring of gratitude from the hearts of his admiring colleagues.

However, we can not take this unselfish action without indirectly laying the groundwork for future benefits to ourselves. Just as in research, we often stumble upon an unanticipated gem of knowledge—a process amusingly called serendipity—so in making the Shewhart Award we focus attention on high qualities such as intellectual creativeness, scientific modesty, true leadership, altruism, and service to one's fellowman, thereby achieving a moral stimulus to good work to men everywhere over and beyond that which could be expected from hope of material reward.

The background of the Shewhart Medal shows clearly that the quality characteristics that we deem most important in the selection of the Shewhart medalist are subjective in character. They admit very little of quantitative measurement and not at all of expression in numbers in the concise ideal of Lord Kelvin. I ask, are we not happier to have it that way? We are a professional society devoted to the scientific method, exactitude and precision, at least within a probability sense. Yet, once a year, we take a momentous action predicated upon the judgment of a selected committee with respect to the consensus of what we, as a group, feel and believe rather than what we have measured and know. However, I can assure you with all certitude and without the benefit of even a correlation coefficient, that the professional progress of Edwin G. Olds, as a function of time, is a smooth monotonic curve, with positive first derivative and probably a positive second derivative that differs significantly from zero.

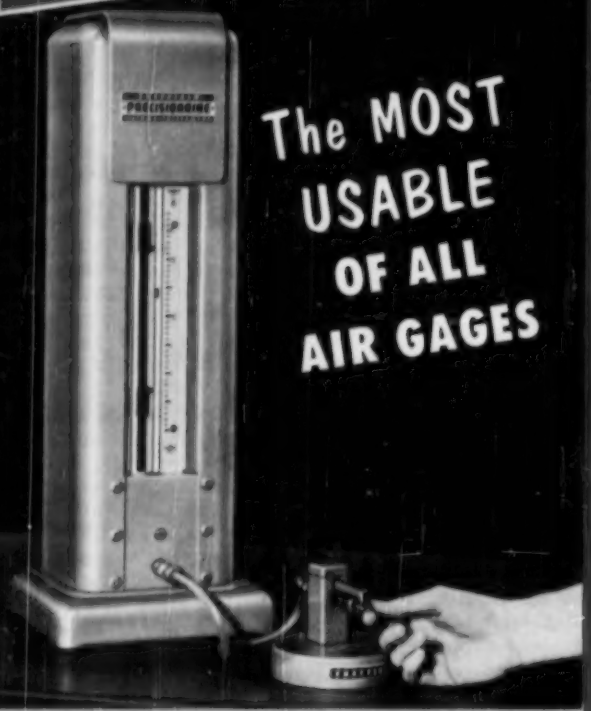
Olds received his A.B. from Cornell University at the tender age of 20. His age differs so little from mine that I prefer not to mention the date. He received his master's degree and doctorate from the University of Pittsburgh. He has been a member of the faculty of Carnegie Institute of Technology since 1922 where he advanced steadily from instructor to full professor. His academic career

*The full text of Prof. Olds' address appears on page 5 of this issue.

Learn About Holes*

What You Can

WITH SHEFFIELD'S PRECISIONAIRE



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High precision with instant response

•

Has widest amplification range — 100 to 100,000-1

•

Accommodates widest tolerance range — .000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read — no need to squat and squint

•

Human error minimized

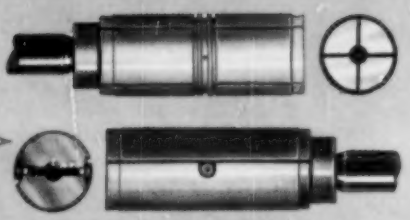
•

Checks one dimension or many simultaneously

•

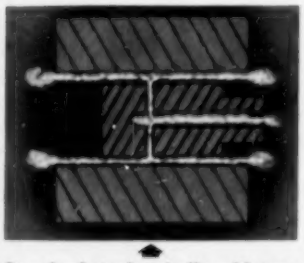
Elements have long service life

BASIC INTERNAL TOOLING ELEMENTS

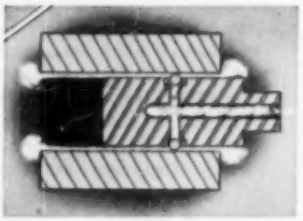


AIRJET SPINDLE

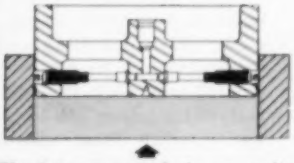
For True Diameter



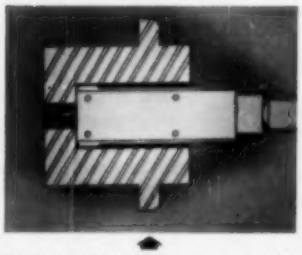
Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005" or less and surface finishes of less than 65 rms.



Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.

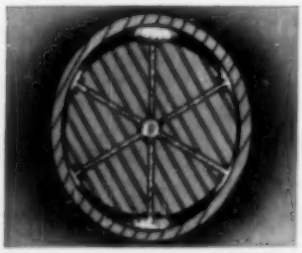


Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.



Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.

Adjustable spindles and kits are available to cover ranges of ⅜" to ⅞"; ⅞" to 1½"; 1" to 3"; 1½" to 3" and 3" to 12".



For Average Diameter

Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

7210

MORE PRECISIONAIRES BOUGHT . . . . . .

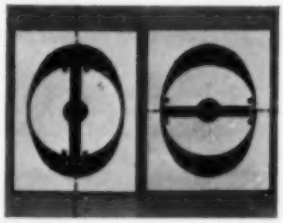
Learn About Holes*

BALLJET SPINDLE

BLADEJET SPINDLE

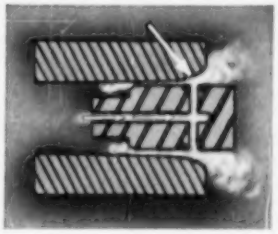
PLUNJET CARTRIDGES

For Out-of-Round



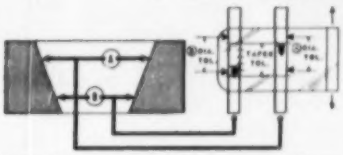
Indicated when any spindle is rotated through 90 degrees.

For Bell-Mouth



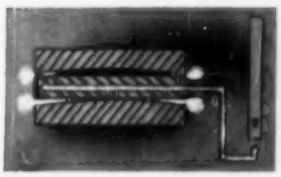
Indicated as any spindle enters or is withdrawn from the bore.

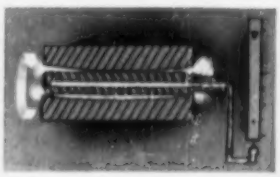
For Taper



Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

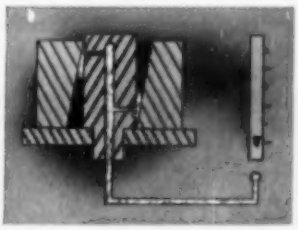
For Camber

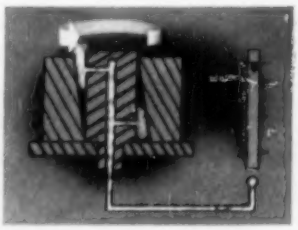


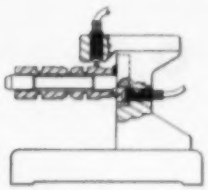


Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

For Squareness of a Bore Axis with a Face



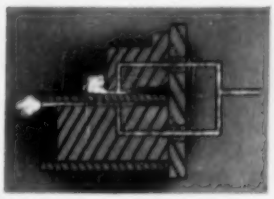




Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

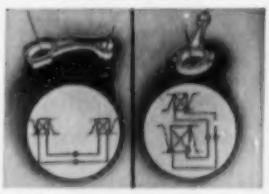
Plunjet fixtures may also be used.

For Concentricity



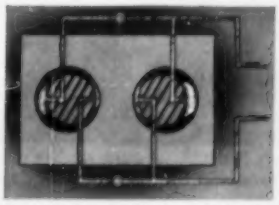
Opposed jets in a locating fixture.

For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

For Center Distance Between Holes



By a fixture with two spindles each having two opposed jets.

*For checking external dimensions, relationships and countless other conditions, write to Div. 600, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

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MANUFACTURE AND MEASUREMENT FOR MANKIND

. . THAN ALL OTHER MAKES OF AIR GAGES

Introducing your 1955-56 operating and executive committees—Seated are the executive directors, J. Y. McClure, C. R. Burdick, P. K. Leatherman, W. P. Goepfert and W. R. Purcell. Standing are Dorian Shainin, vice president; P. A. Robert, junior past president; E. E. Schiesel, treasurer; D. L. Lobsinger, vice president; Arthur Bender Jr., president; Leon Bass, vice president; J. H. Toulouse, vice president; and C. E. Fisher, executive secretary.

alone should afford great satisfaction to almost any man, yet it is his extra-curricular activities that have led primarily to the honor we bestow upon him tonight.

A large portion of our membership knows Olds for his work in the World War II courses in quality control sponsored by the Office of Production Research and Development of the War Production Board. Certain it is that he, along with others, brought to these courses the discipline of the classroom, the objectivity of the teacher, the open-mindedness of the scientist and humanizing influence and good fellowship of his warm personality. However, Olds' work in quality control began long before 1943, the initial date of these courses.

I had the good fortune of being associated with Olds at a very early date, when almost everyone in the quality control field attended the relatively rare meetings or symposia on the subject. He was, and perhaps still is, by methodology a mathematician; and some of the tenets of quality control diverge widely from the concepts of that science which, according to C. I. Lewis, of all human endeavors admits most of certitude and precision. For example, "We choose the 3-σ limits because they appear to work in practice" is certainly shocking from the mathematical viewpoint. Certainly many of the views expressed by proponents of quality control seemed at variance with the strict discipline to which Olds was accustomed. He

President Paul Robert presents the 1954 Shewhart Medal to Prof. E. G. Olds; the Brumbaugh Award for the best article in Vol. X of IQC to Prof. D. B. Delury; the Saddoris Award for Section Management to D. F. Flanders, chairman of the Indianapolis section which placed first in the 1954-

could not teach what he did not believe; he could not believe what he did not discuss; and he could not keep his mouth shut. Exchanges of views, so often stimulated by Olds, not only distinguished the valid from the invalid on frequent occasions, but led to more thought and more papers of a fundamental character. Perhaps his own solutions to problems raised in conferences contributed in part to his being the current president of the Institute of Mathematical Statistics.

An enumeration of all of Olds' activities in the interest of quality control would be tedious. Among his industrial contacts, he has long been a member of Committee E-11 of ASTM on quality control of materials. He has almost always taught courses in quality control at the university; and, according to C. C. Craig, has participated in about 50 intensive courses in quality control. He has held numerous offices in our statistical societies and was instrumental in the formation of ASQC.

His teaching has amplified our ranks, his direct assistance has clarified our thinking, his research has contributed to the validity of our methods, and his published work has placed tools in our hands to give leverage power to our efforts. Tonight we are honored to do honor to our worthy, loved, and respected colleague, Ed Olds.

The citation to Professor Olds reads as follows: "In recognition of his contributions of the development of quality control principles; his pioneering in connection with the quality control courses given by the Office of Production Research and Development, War Production Board; and his teaching, inspiration, and technical contributions to the foundation and growth of—the American Society for Quality Control."

Dr. Duayne Orton, editor of THINK MAGAZINE, was introduced by President Robert. Dr. Orton's address entitled, "American Know-Why," was truly inspirational. Starting with the well known idea that America's industrial supremacy has been due in the past largely to "American Know-How," Dr. Orton developed the thought that American industry has been able to retain this supremacy largely through adding "know-why" to its thinking as well as "know-how."

The concluding portion of the banquet ceremonies consisted of the presentation of the new officers for 1955-56. They are

President: Arthur Bender, Jr.
Vice Presidents: Leon Bass
Dale L. Lobsinger
Dorian Shainin
Julian H. Toulouse
Executive Secretary:
C. Eugene Fisher
Treasurer: Ervin E. Schiesel

The new Executive Directors for the coming year were presented also. They are Clarence Burdick, William Goepfert, Paul Leatherman, J. Y. McClure, and Warren Purcell.

EXHIBITS

One of the important parts of the Ninth Annual ASQC Convention was the exhibit area in the Hotel Statler. The American Society for Quality Control and the Book Booth were represented, as usual, and were supplemented by next year's hosts from Montreal—the Tenth Annual Convention Committee. The manufacturers who exhibited were as follows: American Cystoscope Makers, Inc., New York, N. Y.; American Optical Co., Buffalo, N. Y.; Bausch and Lomb Optical Co., Rochester, N. Y.; Bendix Radio Div., Towson, Md.; Custom Scientific Instruments, Inc., Arlington, N. J.; J. W. Dice Co.; Englewood, N. J.; Elliott Service Co.; Mt. Vernon, N. Y.; Friden Calculating Machine Co., San Leandro, Calif.; International Business Machines Corp., New York, N. Y.; Johnson Gage Co., Bloomfield, Conn.; Jones and Lamson Machine Co., Springfield, Vt.; Karl-Heitz, Inc., New York, N. Y.; Marchant Calculators, Inc., Oakland, Calif.; Monroe Calculating Machine Co., Orange, N. J.; National "U" Association, Springfield, Mass.; Nilson Gage Co., Poughkeepsie, N. Y.; Pepsi-Cola Co., Long Island City, N. Y.; Perkin-Elmer Co., Norwalk, Conn.; Philip Morris & Co. Ltd., Inc., New York, N. Y.; Scale Specialties and Systems, Inc., Roseland, N. J.; Scherr, George Optical Tools, Inc., New York, N. Y.; Sperry Products, Inc., Danbury, Conn.; L. S. Starrett Co., Athol, Mass.; Steel City Testing Machines, Inc., Detroit, Mich.; Thwing-Albert Instrument Co., Philadelphia, Pa.; Van Keuren Co., Watertown, Mass.; Wilson Mechanical Instrument Div., New York, N. Y.

55 competition; and a Merit Citation for conducting the Ninth Annual Convention to Prof. E. R. Ott, general chairman of the Metropolitan section's convention committee.

Management's Corner

J. M. JURAN, *Editor*

Correspondence is invited on potential contributions or problems appropriate for discussion in this department. Address your suggestions to:

J. M. Juran
Consulting Management Engineer
195 Beech Street
Tuckahoe, N. Y.

Dealing with the "Obstructionist" Superintendent

At a gathering of Quality Managers a young executive was eagerly relating how they had reduced waste in his company, how through quality control they had discovered some new things about the process, and how the production superintendent had taken action.

One of the listeners shrugged his shoulders.

"In my company you wouldn't get to first base with that, and all because of Emil."

Emil, it turned out, was an "old-time" production superintendent. Emil was set in his ways. Nothing could make him change. And the management was just too soft-hearted to take Emil off the job because he had 31 years' service, and had been on his job 13 years. Emil still had six years to go for retirement. Until then, no progress was possible.

Then a curious thing happened. Another listener interrupted:

"One of our superintendents is just like that—only his name is Charlie." Then followed a whole chorus of interruptions. Everyone, it seemed, knew in his own company a superintendent, a manager, or a foreman who fitted the description of Emil.

So Emil is everywhere, only his name is something else. But for the quality control man, is this a fate or a problem? Is no progress possible, or is the need only to find a solution which fits Emil?

I have met Emil in many plants. From him, from his bosses, from his associates, and from his subordinates I have learned much about him and his attitudes, including his attitude toward quality.

Curiously enough, Emil would rather make good products than bad ones. He likes to have it said of him that "Emil does a good job." Emil would rather have a high rate of yield than a low rate, because then he can meet his delivery schedules easier. Emil would rather have his men make high earnings than lose those earnings in rework. I have never met a production head named Emil or otherwise who preferred bad work to good work.

The Emils I have met have some other things in common. Out of a long career with the company, they can recall many pleasant memories but also some bitter ones. Here and there they have endured an uninspiring boss, a siege of unwarranted blame, or a piece of skulduggery from some industrial adventurer who tried to rush through in two months what takes a year or two to mature.

Emil looks to these experiences for much guidance to meet the problems ahead. He is getting on in years and he is slowing up. No longer does he consider it a calamity if he is passed up for promotion. But it would be a real calamity if he should be blamed for some big failure, and risk losing the status he already has.

It took Emil many years to become a superintendent. Most of the fellows he started with are still on the machine or on the bench. In their eyes, and in his own eyes, he has arrived.

Emil is reconciled to the idea that he will probably never get to be manager. Younger fellows have already passed him up in enough numbers to make this clear. The big thing, for Emil, is not to lose his job as superintendent. The young superintendents are of a different mind. The last thing they want is to remain a superintendent all their life. They can afford to gamble and take chances with new ways. But Emil is too far along in years and in service to dare to gamble.

So Emil uses the utmost caution to protect his flank. His security is not threatened one bit by the usual day-to-day fires he must put out. He has been doing that for many years, and knows how to cope with the day-to-day problems. Any threat to his security will not come from these familiar problems, but from something which is *to him* unfamiliar and untried.

This brings us to the heart of the problem of dealing with the "obstructionist." Emil is going to "obstruct" whatever is a threat to his security. He would not be human if he acted otherwise. The problem in dealing with Emil is "simply" to avoid a threat to Emil's security.

For some engineers this is all wrong. They are advocating something that is so logical (to them) and so valuable to the company (in their opinion). Why should this not be adopted forthwith? Why is it necessary to act out a game with Emil, to cater to his whims, to make it seem that it is really his ideas which are being put into effect?

In particular the engineers reproach their own top management. Emil, they say, should be ordered to put these new ideas into effect. Yet this suggestion by the engineers betrays shocking ignorance of the fundamental rules of organization. If top management is to hold Emil responsible for results, it must give him collateral authority to decide, to act. To order him to adopt this or that new proposal would be taking away with the left hand the authority top management gave Emil with its right hand.

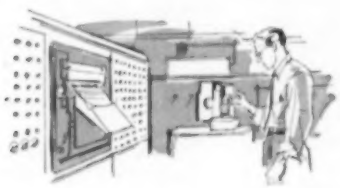
So there is no escape from selling Emil himself on the ideas. If the engineers could only grasp this fact! Once they put their minds to it, they could discover many devices for selling; in fact, they could borrow them intact from other heads in their own company. If they make their first job that of convincing Emil that they are no threat to his security, they have crossed the real barrier.

My own rule for judging whether Emil is going to be a problem is to discover whether Emil has (a) integrity, and (b) common sense. If these things are present, the limitations on results lie only in the sales ability of the engineers.

Quality Control...

You can see it Best at Alcoa in terms of a single Aluminum Forging

As far back as the melting pot at Alcoa's Massena, New York, plant, quality control was at work on this forging. Quantometers analyzed the melt in minutes to make sure the ingot, as poured, would be on the nose.



When the ingot cooled, a sample slice was taken from it, polished and etched. A powerful microscope laid bare its grain structure.

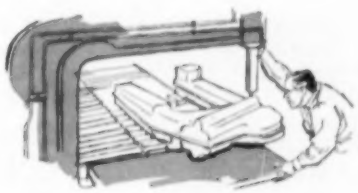
Then the ingot was rolled into a bloom—worked into finished forging stock. Ultrasonic inspection at this point combed the finished stock for hidden flaws with high-frequency sound.

On to the blocking dies at Alcoa's Cleveland forge shop. After the first 50,000-ton squeeze, the rough forging was cleaned and etched. Trained eyes scanned its surface for minor flaws and breaks. Ultrasonic instruments probed its innards for cold shuts and tiny defects.

Next the finishing dies. Now the finished forging underwent another ultrasonic inspection, etching and surface scrutiny. A test section was cut from it and tested for tensile, yield, elongation and creep. Destructive testing it's called.

Other sections, from areas of greatest strain, were polished and etched. Forging experts checked these under microscope to make sure the tough, fibrous grain structure was properly aligned for ultimate strength.

Now for heat treatment. Separately forged test bars from the same parent metal were heat-treated along with the finished forging. These samples and the finished forging, too, were Brinell tested for specific hardness.



The finished forging moved on to Zyglo inspection where fluorescent dye revealed any minute surface flaws under black light.

All these tools of quality control are employed in every Alcoa forge shop on a rigid, statistical basis.

To the customer, these inspections mean fewer rejects, less wasted machine time, lower costs, avoidance of salvage operations.

To the user, these inspections mean safety and a product he can trust.

To Alcoa, these inspections are a practical definition of quality control.

Bibliography

JOSEPH MOVSHIN, *Editor*
Assisted by the Editorial Committee, St. Louis Section, ASQC

On matters concerning the Bibliography Department, send correspondence, suggestions, and contributions to:
Joseph Movshin
9220 Old Bonhomme Road
St. Louis 24, Mo.

APPLICATION—AUTOMOTIVE INDUSTRY

NEW SAE DIMENSIONING STANDARD, by Col. C. M. Buhl (Budd Co.), Dean Jasper Gerardi (University of Detroit) and G. L. McCain (Chrysler Corp.)
(SAE Journal—v. 63, n. 5, May 1955, p. 35)

This article describes the new Society of Automotive Engineers standards for tolerances involving geometric relationships and position. Such standards were necessary due to problems of interchangeability that developed in following manufacturing prints of other companies in which different interpretations of tolerances were possible. The article is illustrated. These standards are part of the SAE Automotive Drafting Standards which have been published recently.

APPLICATION—METALLURGICAL INDUSTRY

SYMPOSIUM OF THE CONTROL OF QUALITY IN PRODUCTION OF WROUGHT NONFERROUS METALS AND ALLOYS, 3. Control of Quality in Heat-Treatment and Final Operations.
(Journal of the Institute of Metals—v. 83, pt. 6, Feb. 1955, p. 193)

This third symposium issue contains a series of articles relating to the control of quality in heat treatment of finished metal products and some information on their inspection and testing. Some statistical methods are indicated.

"Assessment of Quality of Wrought Products," by W. G. Shilling

"Control of Quality in Heat Treatment and Final Operations in Production of Rolled, Extruded, and Drawn Aluminum and Aluminum Alloys," by A. J. Field, and J. Salter

"Heat-Treatment and Finishing Operations in Production of Copper and Aluminum Rod and Wire," by H. J. Miller

"Control of Quality in Heat-Treatment and Finishing of Copper and Copper-Base Alloys," by V. B. Hysel and T. W. Collier

Production of Light-Alloy Drop-Forgings, Their Heat-Treatment, Inspection and Testing," by W. T. Edmunds and R. G. Lloyd

"Nickel and Nickel Alloys," by W. Betterridge, and T. F. Cound

APPLICATION—TEXTILE INDUSTRY

PREVENTIVE MAINTENANCE CONTROL OF MACHINERY, by Norbert Lloyd Enrick (Modern Textiles Magazine—v. 36, n. 5, May 1955, p. 45)

Continuing as Number 4 in the series of articles discussing Quality Control in textile mills, this article discusses the use of Statistical Quality Control data as the basis of preventive maintenance control of machinery. The article discusses such a program together with forms used for this work. The correlation of preventive maintenance with other controls is stressed. Similar maintenance program for laboratory equipment is also discussed.

CORRELATION

STATISTICAL CORRELATION—A SOLUTION TO PLASTICS MOLDING PROBLEMS, by Harold Gulde (Minneapolis-Honeywell Regulator Company)
(Society of Plastic Engineers—v. 11, n. 3, Mar. 1955, p. 23)

This article is the seventh in the series "Statistical Quality Control for the Plastics Molder"

A description of the techniques of linear correlation and regression as applied to molding variables. The article has diagrams, formulas and worked out examples illustrating the methods, as well as a list of precautions to be remembered when using correlations. There is a bibliography at the end.

ENGINEERING AND EXPERIMENTS

HOW TO USE SHORT-CUT STATISTICS, by F. Proschan and A. R. Babcock, Jr.
(Chemical Engineering — Sept. 1954, p. 193)

This article discusses simplified techniques which may be used to estimate reliability of engineering data. Basically, these techniques measure the reliability of an average for significant difference of samples. Factors are provided for estimating the 95 percent limit of error for a series of measurements. Tables for critical departure values for small samples as well as large are also given. The more formal techniques for large samples are also discussed. This article describes the procedure in detail with examples.

PROCESS CAPABILITY ANALYSIS, by Leonard A. Seder (Quality Control Consultant, Malden, Massachusetts)
(Society of Plastic Engineers Journal—v. 11, n. 4, Apr. 1955, p. 15)

This is the eighth article in this series.

This article discusses first a question which management must face, "How far is it sensible to go in improving quality?" Then the elements of capability analysis are listed and discussed briefly.

Making a simple capability analysis and its limitations follows, after which three additional techniques are given. These are the multi-vari chart, the analysis of variance and the span-plan. The first and third of these are explained in considerable detail.

The article is illustrated with charts and has a list of references.

SIGNIFICANCE, by Gilbert L. Peakes (Bakelite Company, Division of Union Carbide & Carbon Co.)
(Society of Plastic Engineers Journal—v. 11, n. 5, May 1955, p. 11)

Ninth article in the series.

The subject of significance is discussed under the following headings:

1. General
2. "t" for comparison of an average with a standard
3. "t" for comparison of one average with another
4. "F" for comparison of one dispersion with another
5. Chi-Square for comparison of actual counted objects or events with expected counts.

Each of these are discussed and illustrated with a worked out example.

References are listed at the end.

MANAGEMENT AND PERSONNEL, GENERAL

BYPRODUCTS OF QUALITY CONTROL PAY BIG DIVIDENDS, by Dale A. Cue (A. O. Smith Corp.)
(SAE Journal—v. 63, n. 5, May 1955, p. 47)

This article was drawn from a panel discussion and presents many of the advantages of quality control. Some of the industrial situations necessary to make quality control work are also indicated. The article describes some of the basic thoughts underlying modern Statistical Quality Control, the concept of variability, and process capability. Discussed are the problem of action based on statistical control findings, and the attitude of those involved. The concept of the economic level of quality, quality criteria, and responsibility, are indicated. Thoughts in the following areas are indicated:

In-process control
Engineering tolerances and gaging
Rejected material and salvage
Deviation from specifications

Inspection problems related to procedures, inspection audits, AQL, and vendor rating are also indicated. The article concludes with brief comments on the problem of short runs, and the psychological value of Statistical Quality Control.

WORK SAMPLING SOLD SAFETY FOR US, by James Maguire (Service Superintendent, Monsanto Chemical Co., Everett, Mass.)
(Factory Management and Maintenance—v. 113, n. 2, Feb. 1955, p. 93)

This article briefly describes the results obtained following a work sampling study of industrial practice from the standpoint of safety.

QUALITY REPORTING

PICTURE SYSTEM SPOTS THE DEFECTS, by Frank Squires (Quality Control Manager, Lear-Cal Division, Lear Incorporated, Santa Monica, Calif.)
(A Western Industry—Feb. 1955)

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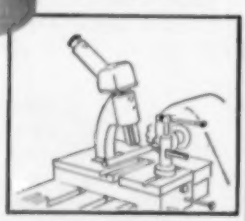

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SAMPLING PLANS & RELATED TOPICS

A SHORT-CUT TO FACT-FINDING, by B. J. Mandel (Chief of the Statistics Branch Bureau of Old-Age and Survivors Insurance, U. S. Department of Health, Education, and Welfare)
(Dun's Review and Modern Industry—v. 65, n. 2325, May 1955, p. 46)

This article discusses the use of sampling techniques primarily for survey fact finding purposes. The basic principles of sampling as applied to this area are discussed in detail. The relationship between probability, universe size and sample size is discussed in non-technical language. Sampling methods such as simple random, systematic random, and stratified sampling are discussed. Judgment samples which do not fully rely on the principles of chance, stratified sampling and quota sampling are also described. Measuring risk of chance and variability is described. The article concludes with a list of misconceptions in this field as well as a summary of the important points in the sampling program.

CONTINUOUS SAMPLING INSPECTION—KEY TO THIS COMPANY'S MASS PRODUCTION, by Alan L. MacLean (Assistant Chief Inspector in charge of Quality Control Minneapolis-Honeywell Regulator Company)
(Factory Management & Maintenance—v. 113, n. 2, Feb. 1955, p. 114)

The advantages of a continuous sampling inspection program in a mass production operation is described. Three sequential sampling charts are used as the basis of acceptance or rejection as well as determining quality level of the process production line. Charts are color coded for ease of use.

STATISTICS

FURTHER CONTRIBUTIONS TO THE THEORY OF PAIRED COMPARISONS, by M. G. Kendall (Biometrics—v. II, n. I, Mar. 1955)

COMPARATIVE SENSITIVITY OF PAIR AND TRIAD FLAVOR

INTENSITY DIFFERENCE TESTS by J. W. Hopkins and N. T. Gridgeman
(Biometrics—v. II, n. I, Mar. 1955)
SOME STATISTICAL PROBLEMS IN RELATING EXPERIMENTAL DATA TO PREDICTING PERFORMANCE OF A PRODUCTION PROCESS, by T. W. Anderson (Columbia University)
(Journ. of the Am. Stat. Assoc.—v. 50, n. 269, Mar. 1955, p. 163)
ESTIMATION OF THE PARAMETERS OF A SKEWED DISTRIBUTION BY LINEAR SYSTEMATIC STATISTICS, by A. E. Sarhan (University of North Carolina)
(Journ. of the Am. Stat. Assoc.—v. 50, n. 269, Mar. 1955, p. 196)
THE EFFICIENCY OF TESTS, by Wassily Hoeffding and Joan Raup Rosenblatt (Annals of Math. Stat. —v. 26, n. 1, Mar. 1955, p. 52)
RANK SUM TESTS OF FIT, by Chia Kuei Tsao (Wayne University)
(Annals of Math. Stat.—v. 26, n. 1, Mar. 1955, p. 94)
ON THE DISTRIBUTION OF THE SAMPLE MEDIAN, by John T. Chu (University of North Carolina)
(Annals of Math. Stat.—v. 26, n. 1, Mar. 1955, p. 112)

OPERATIONS RESEARCH

THE COMPETENCE AND LIMITATION OF SCIENTIFIC METHOD, by Henry Margenau
THE INFLUENCE OF VEHICULAR SPEED AND SPACING ON TUNNEL CAPACITY, by Edward S. Olcott
THE USE OF STORAGE WATER IN A HYDROELECTRIC SYSTEM, by John D. C. Little
THE POISSON DISTRIBUTION AS A LIMIT FOR DEPENDENT BINOMIAL EVENTS WITH UNEQUAL PROBABILITIES, by John E. Walsh
ON THE NUMERICAL SOLUTION OF THE TRANSPORTATION PROBLEM, by H. S. Houthakker
(Journal of the Operations Research Society of America—v. 3, n. 2, May 1955)

REPORTED—NOT REVIEWED

INTRODUCTION — BETTER PLASTIC PRODUCTS WITH STATISTICAL QUALITY CONTROL, by L. M. Debing
(Society of Plastic Engineers, Journal—Sept. 1954)
THE USE OF FREQUENCY DISTRIBUTION DATA IN PLASTICS MOLDING, by Malcolm Young and John A. Kudlock
(Society of Plastic Engineers, Journal—Sept. 1954)
THE NORMAL FREQUENCY DISTRIBUTION, by R. S. Fay
(Society of Plastic Engineers, Journal—Oct. 1954)
THE CONCEPT OF CONTROL CHARTS, PART I, by Delmer C. Dague
(Society of Plastic Engineers, Journal—Nov. 1954)
THE CONCEPT OF CONTROL CHARTS, PART II, by Delmer C. Dague
(Society of Plastic Engineers, Journal—Dec. 1954)
SPECIFICATIONS UNDER S.Q.C., by Dorian Shainin
(Society of Plastic Engineers, Journal—Jan. 1955)
SAMPLING INSPECTION, by Dorian Shainin
(Society of Plastic Engineers, Journal—Feb. 1955)

The above articles that are listed without review are the first in a current series. The 7th, 8th, and 9th are reviewed in this issue of the Bibliography.

Local Section News

". . . BUT NOT FORGOTTEN"

ALBUQUERQUE Dr. Harry G. Romig spoke on "The Role of Quality Control in Industry" at the May 20 meeting of the Albuquerque Section. A large number of visitors as well as members of the section were present for the meeting which was held at the University of New Mexico. An informal dinner preceded the meeting with Ele Baker as after-dinner speaker. Mr. Baker talked about his experiences in excavating and restoring some of the Spanish missions in this area.

BIRMINGHAM In a recent meeting of the Birmingham Section Mel Snow, quality control director, Nutone Corp., Cincinnati, Ohio, got down to brass tacks as the speaker. His subject was "Quality Control—A Review of Fundamentals and Case Histories."

Through H. J. Sparks, Line Material Co., the Birmingham Section has been cooperating with the University of Alabama in presenting a training course on quality control.

A dinner meeting of the incoming and outgoing officers of the Birmingham Section was held at the Redmont Hotel on June 9 for the purpose of discussing section problems and plans for the forthcoming year. Look out Milwaukee! Planning also included a section picnic to be held over the Labor Day weekend.

BUFFALO Our May meeting, the last for the 1954-55 season, was a well attended plant tour with a cafeteria dinner preceding. The American Machine and Foundry Co. did an excellent job as host and our hats go off to Richard Coolbaugh, their quality control manager, and his very helpful staff.

BURLINGTON On Apr. 15 the Burlington Section held its monthly meeting at the Waterman Bldg., University of Vermont, Burlington. The guest speaker was Dr. George R. Stibitz, consultant in applied mathematics, who spoke on "Computing Aids in Solving Mathematical Problems." His talk was instructive and, at the same time, vastly entertaining as he brought in much background, history and applications of the field of numerical Automation.

Dr. Stibitz has had an extensive career with General Electric and Bell Telephone Laboratories. From 1941-45 he was with the National Defense Research Committee

and lists among his many inventions several of the earliest large-scale automatic computer devices.

ERIE On May 4th Fred C. Leone, director of the Statistical Laboratory, Case Institute of Technology, presented his topic "Prediction Equations In Quality Control." Mr. Leone is also chairman of the Cleveland Section for 1955-56 and ground-work was done towards a joint Cleveland-Erie meeting this coming season.

GEORGIA The fifth and last meeting of the Atlanta group of the Georgia Section of ASQC was held on Tuesday, May 31, at 8 p.m. in Room 1833 of the Hurt Bldg., a conference room of the Southern Bell Telephone and Telegraph Co.

Dr. Robert N. Lehrer, of the Industrial Engineering Department, Georgia Institute of Technology, talked on the use of "Statistical Methods in Time Study." By case illustrations, he explained both advantages and disadvantages. While the statistical method is very important in analysis of observations concerning one operator, often times there are not sufficient operators to represent a normal population.

INDIANAPOLIS Arthur Bender, Jr., speaker of the evening, gave a brief history of this section's past ten years and predicted the future. The program also included a drawing from which six pairs of tickets to the 1955 "500 Mile Race" at Indianapolis were given away. Presentation of the tickets was the climax of a program conducted throughout the past year to induce more members to attend the regular monthly meetings.

INDIANAPOLIS Columbus Sub-Section Virgil Alexander, chief inspector, Adams Division of LeTourneau - Westinghouse Corp., addressed the May 12 meeting of the Columbus Sub-Section.

INDIANAPOLIS Richmond Sub-Section A sound movie entitled "Modern Quality Control" was shown at the regular monthly meeting on May 12.

KANSAS CITY Approximately 40 members attended the May dinner meeting on the 11th. After the dinner, business meeting and installation of officers for the forthcoming year, Leon Bass, General Electric Co., delivered his talk "Vendor Certification" which was supplemented by the showing of slides.

LOS ANGELES At the May meeting of the Los Angeles Section James R. "Roy" Crawford expounded on one of his favorite subjects "Work Sampling." Roy's approach to problems of this sort is refreshing since he can make the most complicated problem simple.

NEW HAVEN The final meeting of the 1954-55 season was held on May 10, 1955, at the Colonial House, Hamden, Conn. The guest speaker, Warren R. Purcell, consultant with Rath & Strong, Inc., Boston, Mass., addressed the group on "Uses of Median and Range Charts." Mr. Purcell's informative presentation was well received by members and guests. Prior to the lecture and meeting a social hour and delicious dinner was enjoyed by all.

RICHMOND An illustrated talk on the why and how of statistical sampling inspection leading up to the factors involved in the selection of sampling plans was given by G. F. White, Jr., statistical engineer with Reynolds Metals Co., at the May 17 dinner meeting.

The Richmond Section is again grateful to Dr. Herbert Arkin for the generous giving of his time to instructing a small group in some of the advanced techniques of SQC. Dr. Arkin, Dean of the School of Statistics, College of the City of New York and industrial consultant, has devoted one evening a week in Richmond (as he has during the past two years) to the teaching of analysis of variance and design of experiments. His interest and assistance has certainly done much to raise the level of application of SQC in the Richmond area.

ST. LOUIS The May meeting of the St. Louis Section was the yearly social evening at which time the officers of the section were installed. This Social Evening was primarily a "family night." The local section officers put on a Monte Carlo Night where gambling was in full swing. After a set time this phase of the evening's program was closed and by way of film we were taken to the race track where we all had the fun of placing our bets. After the races an old fashioned auction took place the prizes for which were donated by various industries of St. Louis. Refreshments for the evening were the compliments of the St. Louis Section. This proved to be one of the best social affairs ever held by the St. Louis Section and everyone in attendance suggested that it be repeated next year.

SOUTH BEND-MISHAWAKA The South Bend-Mishawaka Section held its meeting on May 13 at which time Richard C. Calahan gave a report on personal observations on "Development of Statistical Control in Scotland." Mr. Calahan had just returned from a sojourn in Scotland where he had been introducing statistical methods to the Singer Mfg. Co. activities in that country. Section members and guests enjoyed his interesting presentation.

Certificates of appreciation were awarded to the outgoing officers; the new officers for the 1955-56 fiscal year were also announced at the meeting.

TRENTON On May 6 the Trenton Section closed its 1954-55 season with a dinner meeting which was held at the Glendale Tavern. Dr. John Goodner Gill, vice president of Rider College spoke on "Responsibility of the American Citizen."

WORCESTER Alexander Strong, officer and director of Rath & Strong, Boston, Mass., spoke on "Quality Control; It's Implications and Potentialities" at a meeting of the Worcester Section on May 19. The meeting was well attended. Mr. Strong gave an excellent talk which was enjoyed by all present.

YOUNGSTOWN A large group of members and their wives enjoyed a visit to Nela Park in Cleveland consisting of a tour through the world famous General Electric Lighting Institute to see working demonstrations of home, school, office and industrial lighting techniques. Following the tour the group was served refreshments.

"FOR MANY ARE CALLED, BUT FEW ARE . . ."

BIRMINGHAM The officers elected by the Birmingham Section for the forthcoming year are as follows: Chairman, Allen Haskell, United States Steel Corp., Birmingham, Ala.; Vice Chairman,

Neill Zimmerman, Line Material Co., Birmingham, Ala.; Secretary-Treasurer, Ed Phelps, American Cast Iron Pipe Co., Birmingham, Ala.

BUFFALO The officers for the 1955-56 fiscal year of the Buffalo Section are: Chairman, Ed Sexton, Best Foods; Vice Chairman, Bob Stohr, Carborundum; Secretary-Treasurer, Al Kukla, Aluminum Co. of America.

BURLINGTON At the April 15 meeting the following officers for the coming year were elected: Chairman, Carlton Murphy, National Carbon Co., St. Albans, Vt.; Vice Chairman, Daniel Lundvall, General Electric Co., Burlington, Vt.; Secretary, Robert Martell, Jones and Lamson Machine Co., Springfield, Vt.; Treasurer, Robert Leavitt, Owens-Illinois Plywood, North Troy, Vt.

CHATTANOOGA The 1955-56 officers for the Chattanooga Section are: Chairman, W. H. Corwin, Brock Candy Co., Chattanooga; Vice Chairman, L. J. Demorest, Chattanooga; Secretary, William Whigham, E. I. duPont de Nemours and Co., Chattanooga; Treasurer, R. H. Kimbrough, E. I. duPont de Nemours and Co., Chattanooga.

CHICAGO The following are the newly elected officers for the Chicago Section for the 1955-56 fiscal year: Chairman, Marjorie Sutherland; Vice Chairman, Robert I. Tenney; Corresponding Secretary, Eugene G. Freund; Recording Secretary, Alfred C. Schuber; Treasurer, Ralph Haertel.

GRAND RAPIDS Elected May 19 at the annual business meeting are: Chairman, Riley Chambers, AMI, Inc.; Vice Chairman, J. G. Ripstra, American Seating Co.; Secretary, Carl Krause, AMI, Inc.; Treasurer, Anthony Zimnowski, Lear, Inc.

INDIANAPOLIS Kermit Flanagan, Linde Air Products, Indianapolis, has been elected to replace Richard Shaw as Secretary for the Indianapolis Section for the coming year. Richard Shaw is leaving Indianapolis for employment in Ohio.

INDIANAPOLIS Columbus Sub-Section The Columbus Sub-Section has elected the following officers for the coming year: Chairman, M. C. Broach; Vice Chairman, L. Weinstein; Secretary-Treasurer, R. P. Welch.

NEW HAVEN Robert I. Callahan, quality control manager of the Revere Corporation of America, Wallingford, Conn., was elected chairman at the April meeting succeeding Kendrick W. Ralph, quality control manager of R. Wallace and Sons, Wallingford. Other officers elected for the 1955-56 season were: Vice Chairman, Gerald J. McVey, Armstrong Rubber Co., West Haven, Conn.; Secretary, Arthur A. Stolzenberg, Safety Car Heating and Lighting Co., Inc., Hamden, Conn.; Treasurer, Jack D. Bradshaw, Bradley Laboratories, Inc., New Haven, Conn.

RICHMOND The new section officers for 1955-56, elected at the May 17 meeting, are: Chairman, G. F. White, Jr., Reynolds Metals Co.; Vice Chairman, H. E. Stevens, American Viscose Co.; Secretary, J. R. Thomen, E. I. duPont de Nemours & Co.; Treasurer, R. H. Neal, Philip Morris Co.

SOUTH BEND-MISHAWAKA For the 1955-56 fiscal year the following officers were elected by this section: Chairman, V. A. Nichols (reelected); Vice Chairman, G. C. Kennedy; Secretary, R. B. Boaz; Treasurer, C. M. Makowsky.

TRENTON The newly elected officers for the forthcoming year are: Chairman, John Marck, American Steel & Wire, U. S. Steel; Vice Chairman, Eugene B. McBride, Baldwin Hill; Secretary, Samuel B. Prellwitz, Fairless Works, U. S. Steel; Treasurer, Carl W. Banks, Crescent Wire Co.

YOUNGSTOWN The Youngstown Section has elected for the coming season the following officers: Chairman, D. J. Ausmus, Joy Mfg. Co.; Vice Chairman, Frank Jayne, Trumbull Lamp Works; Secretary, Charles Cooper, Packard Electric Co.; Treasurer, W. J. Cain, Republic Steel Corp.

"AS YE SOW . . ."

WASHINGTON UNIVERSITY On Sept. 8-16, 1955 the Department of Industrial Engineering, Washington University, will offer an intensive eight-day course in the basic principles of statistical quality control. Arrangements have been made to hold the classes in air-conditioned classrooms; co-sponsor for the course is the St. Louis section.

The instructional staff for the course will include Irving Burr, Purdue University; John A. Henry, Univer-

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sity of Illlinois; Mason Wescott, Rutgers University; Joseph Movshin, Ramsey Corp.; and Donald Kaufman, Washington University. Further information or registration forms may be obtained from Donald J. Kaufman, Department of Industrial Engineering, Washington University, St. Louis 5, Mo.

DIVISIONS

The 1955-56 officers for the four new divisions authorized by the Board of Directors at its May 25, meeting are as follows:

Administrative Applications

Chairman—Howard L. Jones
Illinois Bell Telephone Co.
Chicago, Ill.

Vice-Chairman—Dale L. Lobsinger
United Air Lines
Denver, Colo.

Secretary—William Buhl
B. F. Goodrich Co.
Akron, Ohio

Treasurer—Harmon S. Bayer
Quality Control Consultant
Detroit, Mich.

Aircraft

Chairman—J. Y. McClure
Convair Div.
Fort Worth, Texas

Vice-Chairman—H. B. Epstein
Chance Vought Aircraft Corp.
San Diego, Calif.

Secretary—R. D. Humphries
Cessna Aircraft Co.
Wichita, Kan.

Treasurer—Howard Todt
North American Aviation Co.
Los Angeles, Calif.

Automotive

Chairman—John S. Randall
Chevrolet-Central Office
Detroit, Mich.

Vice-Chairman—J. Clayton Knapp
Ford Motor Company of Canada, Ltd.
Windsor, Ont.

Secretary—Brent C. Jacob, Jr.
Chrysler Corp.
Detroit, Mich.

Treasurer—Irvin DeGrote
Ford Motor Co.
Dearborn, Mich.

Electronics

Chairman—A. B. Mundel
Sonotone Corp.
Elmsford, N. Y.

Vice-Chairman—Leo J. Jacobson
International Resistance Co.
Philadelphia, Pa.

Secretary—Irvin W. Schoeninger
Globe Union, Inc.
Milwaukee, Wis.

Treasurer—D. D. Ward
General Electric Co.
Utica, N. Y.

Councilors—

2 W. B. Hall	11 J. E. Gottschall
3 R. R. Pero	12 P. G. Thompson
5 H. A. Schumer	14 W. A. Berry
9 R. G. Fitzgibbons	

Plans are continuing for a "National Symposium on Reliability and Quality Control" to be held January 9, 10, 1956, in Washington, D. C. This symposium is being jointly sponsored by the Electronics Division and the professional group on quality control for IRE.

Chemical Division

Chairman—H. L. Wehrly
Dow Chemical Co.
Midland, Mich.

Vice-Chairman—J. C. Schmitt
Flintkote Co.
East Rutherford, N. J.

Secretary—D. H. Davis
Post Cereals
Battle Creek, Mich.

Treasurer—E. C. Yehle
University of Michigan
Ann Arbor, Mich.

Councilors—

1 J. D. Hinchen	10 H. Bogin
2 E. L. Bauer	11 R. I. Tenney
3 W. H. Harrington	12 O. A. Kral
4 L. E. Greenop	13 J. H. Batchelor
5 H. B. Wagner	14 C. T. Shewell
6 C. A. Bicking	15 R. S. Bingham, Jr.
8 A. D. Evans	16 Dorothy L. Biggs

Textile Division

Chairman—Edward S. Rudnick
New Bedford, Mass.

Vice-Chairman—John H. Reynolds
Celanese Corp.
Rome, Ga.

Secretary—James N. Little
Anderson, Clayton & Co.
Atlanta, Ga.

Treasurer—Howard L. Loveless
School of Textile Tech
Auburn, Ala.

Councilors—

1 K. V. Chace	5 Paul M. Felker, Jr.
2 Charles A. Ferris	6 Richard C. Tanner
3 Stephen I. Rudo	15 W. B. Mattocks, Jr.
4 Maurice A. Hawser	

MEMBERSHIP CORNER

Retiring Section Membership Committee Chairmen are reminded to turn their files including the copy of the Membership Committee Manual to the incoming committee chairmen. Also, retiring section chairmen and vice-chairmen are requested to pass on to their successors their copies of the membership manual.

The National Membership Committee would like to express a word of greeting to the new section committee members and to suggest that plans for the coming year should be formulated as soon as possible if our goal of 10,000 members by the tenth anniversary is to be achieved.

Inquiries about membership committee problems should be addressed to Harmon S. Bayer, 1154 Book Bldg., Detroit 26, Michigan.

SIGNIFICANT DIFFERENCES

The Birmingham Section reports promotions of two of its members. A. C. Dorenfeld, who was with C. F. Braun and Company's, Alhambra, Calif., plant has accepted a new position at Los Angeles; H. J. Sparks, Line Material Co., has been promoted to assistant chief inspector.

The Burlington Section has recently created an Industrial Service Committee. Richard Hooley, department of Commerce and Economics, University of Vermont, and chairman of the committee, stated its goal as "The assistance of Vermont firms in finding solutions to problems in the general area of Quality Control." Specifically, the Committee will be dealing with matters of control of production, sampling, inventory control and many others. The section will be making a real contribution to the development of industry in Vermont, since many firms are not in a position to hire professional talent in these specialized fields.

Other members of the committee are: Paul Maker, Research Engineer, Bryant Chucking Grinder Co., Chester Gadzinski, Quality Control, General Electric Co. and Carlton Murphy, quality control inspector, National Carbon Co.

Appointed for a second year as Industrial Development Liaison for the Burlington Section, is Daniel Lundvall of the General Electric QC staff. Lundvall will represent the Section in state efforts to attract new industry and retain the present. He will work closely with such established agencies as the Vermont Development Commission, Associated Industries of Vermont and Chamber of Commerce in coordinating the potential contributions of the section in stimulating state economic growth.

Chester Gadzinski, General Electric Co. and chairman of the Burlington Section for the past two years, was recently elected by the New England Quality Control Conference Council to be program chairman for the Ninth New England QC Conference to be held in Hartford, Connecticut next November.

Several years ago the St. Louis Section established the Lester S. Kauffman Award. The award was essentially for a member of the St. Louis Section who may have during the past sceveral years done the most to promote quality control, both on a local and national level. The recipient of the award this year was Arnold G. Braun of Carter Carburetor Corp. Arnold has held practically every office in the St. Louis Section and was the Treasurer for the Eighth Annual Convention held in St. Louis in 1954. We extend to Mr. Braun our congratulations on being selected for this honor.

On May 1 a new position, "Director of Engineering," was created by the Sonotone Corp., Elmsford, N. Y. August B. Mundel, Metropolitan Section and a member of the Board of Directors, ASQC, was appointed to fill this position. This organization change by Sonotone is designed to improve the channels of communication between all engineering, research and production groups of the company and to improve the coordination of the activities of these groups.

Dr. Louis Webster Jones, president of Rutgers University, announced on May 18 the appointment of Dr. Paul S. Olmstead, statistical consultant for the Bell Telephone Laboratories, to the post of honorary professor of statistical quality control in the mathematics department of University College.

Dr. Olmstead, who has been a pioneer in the development and operation of statistical quality control, joins Dr. Walter A. Shewhart of the Bell Laboratories in serving as an honary professor of statistical quality control at Rutgers.

The Seattle Section notes with deepest regret the recent passing of one its members, A. L. Pond. Mr. Pond joined the Seattle Section in 1953 as a Member grade member and served as Section Treasurer during the 1954-55 year.

What's New?

ROY A. WYLIE, *Editor*

News releases describing new products and literature should be sent to:
George R. Foster, Mng. Ed.
Room 6123 Plankinton Bldg.
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

The Paper Thermometer Company, 10 Stagg Drive, Natick, Massachusetts, has developed THERMOPAPER and THERMOTUBE temperature indicators for use in controlling the quality of temperature-sensitive products during processing, shipping and storage. THERMOPAPERS are a graded series of heat-sensitive coated papers, calibrated to accurately determine temperatures from 113° F. to 580° F. These paper thermometers change appearance sharply from white to black at predetermined temperatures. The changes occur within a fraction of a second and with an accuracy of ±1% of the stated temperature. A strip of THERMOPAPER may be placed flat against a test surface enclosed in an oven or autoclave or at top, bottom and inside of a product where the temperature reading is desired. Suggested uses are for temperature testing in brake testing, plastic molds, heat sealing machines, electric irons, etc. THERMOTUBES are a graded series of sealed-in-glass temperature indicators which change appearance irreversibly from white to black at predetermined temperatures within ±1% of the stated temperature. A THERMOTUBE may be placed at any location or within any object whose temperature is to be read. It will show a sharp white to black color change when the surrounding temperature equals or exceeds the rated THERMOTUBE temperature. The change is irreversible, thus making THERMOTUBE valuable for reading temperatures in inaccessible places or under conditions where

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temperatures can be determined only by subsequent examination. By the use of two or more Thermotubes, the object temperature can be pinpointed accurately.

* * *

The "Precision-Vision 5-Power Magnifier" is being announced by **S. B. Logan and Company**, Box 498, Genoa City, Wisconsin. The magnifier consists of an all aluminum frame, 2" in diameter, ¾" thick, in a black crinkle finish to eliminate reflection and two individual optically-ground and polished 1⅞" diameter lenses, press-locked into mountings, so as to be dustproof and break resistant. The lenses are corrected for spherical aberration to insure high accuracy. The magnifier is light in weight and may easily be carried in any pocket. Magnification is 5 times. Price is $3.50 postpaid.

* * *

Sunshine Scientific Instrument Company, 1810 Grant Avenue, Philadelphia 15, Pennsylvania, has an-

nounced an Automatic Gel Time Meter. This meter measures automatically the time required for a fluid thermosetting composition to reach a point of rapid viscosity change during polymerization. It is an aid in the evaluation of thermosetting compositions used in the manufacture of monomers, resins, varnishes, and other protective coatings, or for the study of such variables as reaction temperature, catalyst, inhibitor, quality, and shelf life. The device measures viscosity drag in a test sample by means of a rotating spindle suspended from a torsional spring. At the gel point, viscosity increases suddenly, and the increased drag on the spring closes a switch which sounds a buzzer, stops the timing mechanism, and gives a visible indication. A means is provided to control the temperature of the bath surrounding the sample. Catalog No. 22 describes this instrument in detail.

★ ★ ★

Quality Control Company, 1566 Northwestern Avenue, Los Angeles, California has made available the Height Gage Scope, a new optical accessory for an 18" or a 24" height gage to replace the scriber or in-

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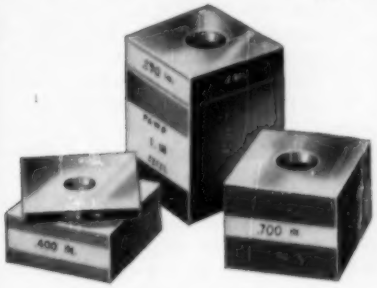

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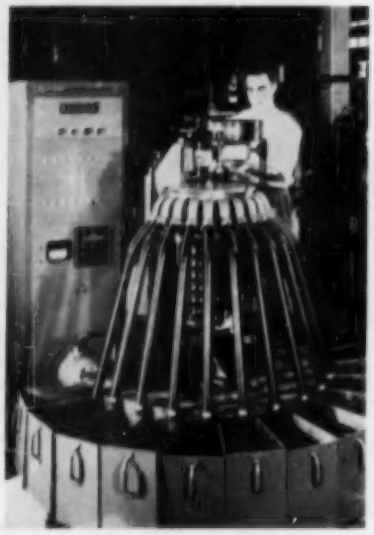
dicator for measuring dimensions without physical contact. The cross-hair is sighted on surfaces or points to be measured and the height gage vernier is read to 0.001" in the usual way. The optical system combines a microscope and telescope to provide an erect image throughout a working distance from 2½" to infinity. Magnification varies from 20X for close-up work to 5X for distant work. The optical axis maintains a straight line within 10 seconds accuracy. The Height Gage Scope may be used for checking jigs, fixtures, layouts, and aligning points. It conveniently checks dimensions on points, wires, grooves, engraving, ordinate stations on curved surfaces, and through transparent objects. It is a self-contained unit and no auxiliary lens are needed. Provision is made for adjusting the optical axis parallel with the reference surface. A concentric circle on the reticle is provided for picking up hole centers without having to know the hole size. Price of the Height Gage Scope is $320.00 F.O.B. Los Angeles.

★ ★ ★



Federal Products Corporation, 1144 Eddy Street, Providence 1, Rhode Island have constructed a completely automatic hopper-fed Electronic Gage, which measures the O.D. of precision ball bearings, ¼" to 17/32", and sorts them into 12 good classifications of 0.00001" each plus oversize and undersize. Operating speed is adjustable to sort bearings up to 24,000 per hour. Another gage of similar design operates at a slightly lower speed to measure a wider range of balls, 1 mm to 1" O.D., and sorts them into 12 good classifications of 0.00001" each plus oversize and undersize. A lifting mechanism retracts the gaging contact before and after measurement to prevent marking of highly polished surface of the balls. The operator fills the hopper and presses the start button; the gage then measures and sorts balls according to diameter. From the rotary type hopper the balls drop into one of the eight holes in the rotating index wheel. As the ball is carried beneath the sensitive contact, the contact is retracted. At the proper time sequence, the sensitive contact is lowered to the ball O.D. and the size is found by the Electronic Gage Head and Amplifier. The impulse from the Gage Head and Amplifier is transmitted to the size station in the classifier which causes a mechanical memory to be set. The sensitive contact retracts and the index wheel transfers the ball to the large wheel which carries it around to the correct size disposal chute. When the ball is at the correct chute, the trap door beneath it is opened by action of the mechanical memory and the ball drops into an oil-filled tote box beneath the gage front. This type of gage can be modified to sort precision roller bearings for diameter, and/or length, to sort dowel pins, cylindrical bearings, precision mandrels, etc.

★ ★ ★

A precision inspection instrument, the Multichek, has been developed for gaging squareness and width of floor tile ranging in size from 6" x 6" to 18" x 18". The operator slides the tile between two Electrichek gage heads and the right hand guide rail. Colored lights on the signal panel then indicate whether or not the tile is within tolerance. If the tile is undersize, the red light goes on; if it is oversize, the green light is illuminated. All lights black out when the tile is within tolerance. Four passes of the part are necessary for complete inspection. Details of this and other special gaging devices are available from the Standard Production Instruments Division, **The Sheffield Corporation,** Dayton 1, Ohio.

★ ★ ★

The Perkin-Elmer Corporation of Norwalk, Connecticut, has made available the Vapor Fractometer, a simple, low-cost, portable apparatus for the analysis of multi-component mixtures of gases or volatile liquids. The new apparatus is based on the principle of gas chromatography and utilizes the fractional separation of vapors by means of a partition column. This type of apparatus will find use wherever mixtures of gases or low boiling liquids are analyzed routinely. The method may also be used for the separation of unknown components from a mixture which can then be qualitatively analyzed by infrared or mass spectroscopy, or other means. Time for analysis varies from ½ to 5 minutes per component. Reproducibility is better than ½%. Sampling techniques and calculation procedures are simple. Complex mixtures can be handled and, in most cases, the accuracy with which trace components can be determined is independent of the concentration or nature of the other components present. Any mixture having boiling points up to 250° C. may be analyzed by this method, and as little as one milligram of sample per analysis is required. The Vapor Fractometer consists of two interchangeable four-foot folded partition columns, which may be used individually or in tandem, a special thermistor-type thermoconductivity cell as a detector, and sampling and temperature controls. The partition columns are mounted in an insulated chamber which may be held at any temperature between room and

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150° C. The apparatus is portable, weighing less than 50 pounds, and measures 30" x 20" x 12". The output of the detector may be connected directly to any standard 10 millivolt recorder without intermediate amplification for making a permanent record of the analysis. Any carrier gas may be used, although helium is recommended for safety, convenience and highest sensitivity.

★ ★ ★

Nife, Incorporated, Copiague, Long Island, New York, has made available the Nife Glass Thickness Gauge for research, development and quality control laboratories for measuring diffraction index and thickness of flat and shaped glass objects. The gauge should be especially useful for production line checking in the manufacture of electronic tubes, bottles and glass products of all shapes. The object to be measured is placed over the light on the instrument. The thickness of the glass is seen on a screen as a ribbon of light which is measured by reading the scale. Defects and variations in thickness can easily be seen by turning or moving the object being checked. Diffraction index is measured by first finding the thickness of a glass sample with a micrometer, then placing sample on instrument and adjusting scale to coincide with the thickness. Two models are available: (1) Type GT-20 with a capacity of 0.2", each scale division being 0.005" and (2) Type GT-40 with a capacity of 0.06", each scale division being 0.001".

★ ★ ★

George Scherr Company, Inc., 200 Lafayette Street, New York 12, New York, is distributing a new Mauser Vernier Depth Gage. The depth gage is equipped with a 0.001" Vernier for fast direct reading. The gage is instantly adjustable to zero by a set screw. A hardened pin, 1/32" in diameter, held securely by a small set screw, is used as a feeler point and enables the operator to measure depth of holes as small as 1/32" in diameter. Small, deep holes may be checked by replacing the standard pin with a hardened, long, straight pin, which can be accomplished within seconds. An open slide permits view of the entire scale for faster reading and elimination of errors. Two models, 3" and 6", are offered at $8.50 and $9.50 respectively.

★ ★ ★

Heil Gage Company, 448 Adirondack Street, Rochester 6, New York, is marketing a set of 86 precision gages of hardened steel from 0.014" diameter to 0.252" diameter. All gages taper 0.0001" for each 0.100" of length. The gages are designed to measure any straight through hole with split tenth accuracy. A gage of the proper range is selected, inserted into the hole, the point at which the gage ceases to enter the hole is marked, the gage is withdrawn, and the diameter measured with a micrometer. These gages are also useful for use as tapered arbors for checking concentricity and may be used to check width of keyways and location of holes in dies, jigs and production parts.

New Literature

The following new literature is available by writing direct to the company listed. Please mention *Industrial Quality Control* when you contact any of the companies mentioned in the "What's New?" department.

A 32-page dictionary of steel terms of particular value to men who buy or use cold finished steel bars is available from the LaSalle Steel Company, Chicago, Illinois. The booklet is titled "Simplified Steel Terms and Engineering Data." Included are more than 180 relatively detailed definitions frequently used in the purchase, manufacture, treating, machining and finishing of steel. More than 30 photographs, curves and tables cover subjects such as Standard Grain Size for Steels, Shepherd Grain Size Fracture Standards, Approximate Hardness Conversion Number for Steel, Equilibrium Diagrams, Method of Determining Harden-ability, Izod Toughness versus Tensile Strength of Heat Treated Steels.

A new-8-page brochure on the several types of recording spectrophotometers manufactured by Beckman Division, Beckman Instruments, Inc., Fullerton, California, is available upon request. Bulletin No. 405 is written to assist the prospective purchaser of recording spectrophotometers and details the requirements for a wide variety of quantitative and qualitative applications and recommends the particular type of instrument for each use.

A 4-page, 3-color brochure describing operation of the new Model 146 Flame Photometer for analysis of alkali metals in solution has just been published by the Perkin-Elmer Corporation, Norwalk, Connecticut. Complete specifications, including sensitivity range for sodium, potassium and other alkali earth metals are included.

American Society News

1954-55 OPERATING AND EXECUTIVE COMMITTEE MEETING

The Ninth Annual Convention of the Society, held on May 23, 24 and 25 in New York, was the occasion for important meetings of the Board of Directors, Operating and Executive Committees and for the Annual Meeting of the Society.

On May 22, the 1954-55 Operating and Executive Committees held their final meeting of the year, reviewing the work of the various committees and preparing recommendations for action by the Board of Directors. Principal among these were petitions from four Technical Committees seeking Division status. The Executive Committee also approved the reports of the Office Pro-

cedures and Convention Policy Committees for submission to the Board for approval of intent.

The Executive Committee approved the petition of the Hamilton, Ontario, group to become a Section. The officers of this new Section, No. 86, are:

Chairman: Marjorie M. Baskerville, Dominion Foundries and Steel, Ltd., Hamilton, Ontario

Vice-Chairman: H. E. Markle, Leland Electric of Canada, Ltd., Guelph, Ontario

Secretary: Charles W. Royal, B. Greening Wire Co., Ltd., Hamilton, Ontario

Treasurer: A. S. Mitchell, Steel Company of Canada, Ltd., Hamilton, Ontario.

ANNUAL MEETING 1955

The Annual Meeting of the Society was held on Monday, May 23, at 4 P.M. in the Hotel Statler. At this meeting the Tellers Committee, under the chairmanship of Mr. Gilbert L. Peakes, presented the results of the balloting for officers for the 1955-56 year. The following were elected to serve:

President
Arthur Bender, Jr.
Delco-Remy Division, GMC
Anderson, Ind.

Vice-Presidents
Leon Bass
General Electric Co.
Cincinnati, Ohio

Dale L. Lobsinger
United Air Lines
Denver, Colo.

Dorian Shainin
Rath and Strong, Inc.
Boston, Mass.

Julian H. Toulouse
Owens-Illinois Glass Co.
Toledo, Ohio

Executive Secretary
C. E. Fisher
Bell Telephone Laboratories, Inc.
New York, N. Y.

Treasurer
Ervin E. Schiesel
Mattatuck Manufacturing Co.
Waterbury, Conn.

Printed copies of the annual reports of the officers of the Society were available at this meeting, and therefore President Robert did not call for detailed oral reports. A number of members attending the meeting took part in a stimulating discussion of the Society's publication policies with particular reference to *Industrial Quality Control*. The constructive suggestions offered will prove helpful in formulating and maintaining a sound publication policy for the Society.

BOARD OF DIRECTORS MEETING

The 1954-55 Board of Directors of the Society held its final meeting of the year on Wednesday, May 25, in the Hotel Statler. Highlighting the action of the Board in a number of matters presented to it was the approval of the petitions of four Technical Committees seeking Division status. These new Divisions are:

Administrative Applications
Aircraft
Automotive
Electronics

With the addition of these divisions the Society now has a total of six, the Chemical and Textile Divisions having been previously established. The new officers for all six divisions are given in the Divisions section of the Local Section News department.

It is desired to point out here that all members who signed the division petitions and paid their dues during this spring are members of the four new divisions for the 1955-56 year. All others desiring membership will need to include division dues along with their Society dues and will be given an opportunity to do so at the time the 1955-56 dues bills are sent out.

The Board of Directors also approved the intent of the recommendations of the Executive Committee that further studies and specific proposals be made to effect consolidation of the Society's several offices and to carry on the Society's business operations under the direction of a paid administrator. The overall plan, which envisions in the near future Convention management as a part of the duties of the administrator, was described to the Board members by Directors Lobsinger and Schiesel, whose *ad hoc* committees have done much of the work in these areas. It is expected that complete plans for the consolidation will be submitted to the Board at its next meeting, scheduled for November 19, 1955.

The results of the elections of Directors for the 1955-56 year were announced. The names of the Directors, the Districts from which they were elected and their terms of office are as follows

Dist.	Name	Term
1	Warren R. Purcell	2 Years
	Leonard A. Seder	1
2	Rocco L. Fiaschetti	2
	George M. Armour	1
3	Paul S. Olmstead	2
	Henry J. Becker	1
4	B. H. Lloyd	1
5	Frederick R. Bailey	2
	Wm. P. Goepfert	1
6	Edward M. Schrock	2
7	Stephen C. Bates	2
8	Norman Kravitz	2
	Robert D. Coffman	1
9	William E. Spencer	2
	David G. Browne	1
10	Clarence R. Burdick	1
11	Henry J. Jacobson	2
	August B. Mundel	1
12	Frederick J. Halton, Jr.	2
	Leslie S. Eichelberger	1
13	Paul K. Leatherman	1
14	J. Y. McClure	2
15	David S. Chambers	2
16	David A. Hill	2
	Edward P. Coleman	1

SCHEDULE OF MEETINGS 1955-56

1955			
July	16	Operating Committee	Chicago, Ill.
Oct.	7	Operating Committee	Detroit, Mich.
	8	Executive Committee	
Nov.	17	Operating Committee	Midwest Conference
	18	Executive Committee	Milwaukee, Wisc.
	19	Board of Directors	
1956			
Feb.	10	Operating Committee	Middle Atlantic Conf.
	11	Executive Committee	Washington, D. C.
April	20	Operating Committee	New York, N. Y.
	21	Executive Committee	New York, N. Y.
June	6	Operating Committee*	10th Annual Convention
	7	Executive Committee*	Montreal, Quebec
	8	Board of Directors*	

*Specific dates to be announced later.

Items for the agenda for any meeting should be in the hands of the President two weeks before the date of the meeting.

These Directors met earlier and chose as Executive Directors for the coming year the following:

Clarence R. Burdick
Houdaille Hershey Corp.
Detroit, Mich.

William P. Goepfert
Aluminum Co. of America
Pittsburgh, Pa.

Paul K. Leatherman
Falstaff Brewing Corp.
St. Louis, Mo.

J. Y. McClure
Convair Div. of General Dynamics Corp.
Fort Worth, Texas

W. R. Purcell
Rath and Strong, Inc.
Boston, Mass.

The selection of the Executive Directors was announced at the Annual Banquet of the Society held on Tuesday evening, May 24 at the Hotel Statler. These Directors, together with the President, Arthur Bender, Jr., and the Junior Past President, Paul A. Robert, constitute the Executive Committee for the 1955-56 year.

MEETING OF 1955-56 OPERATING AND EXECUTIVE COMMITTEES

The Operating and Executive Committees for the new year met on Thursday, May 26, to tackle some of the pressing problems facing the Society in the next few months. Budget figures were presented by the members of the Operating Committee to cover operations during the first quarter of the fiscal year, and the Executive Committee approved a budget for this purpose.

New committee appointments were confirmed and an organization chart, showing the assignments and responsibilities of the officers and committees, will be available shortly.

A schedule of meetings of the Operating and Executive Committees and of the Board of Directors was agreed upon for the coming year. This schedule is shown elsewhere in this issue.

THE SADDORIS AWARD COMPETITION

The committee for the Saddoris Award for Section Management announced that the winner of the 1954-55 competition was the Indianapolis section with 9913 points. In accordance with the competition rules as revised in June 1954 it was decided that all sections achieving a point score of 75 percent of the winning section would earn the title of "Master Section" during the following year. Accordingly the 1955-56 Master Sections are:

Indianapolis	9913
Milwaukee	9817
Michigan	8178
Southern Connecticut	7292
Rhode Island	7140

POSITIONS WANTED

Address all replies to box number references to: American Society for Quality Control Room 563, 50 Church Street, New York 7, N. Y.

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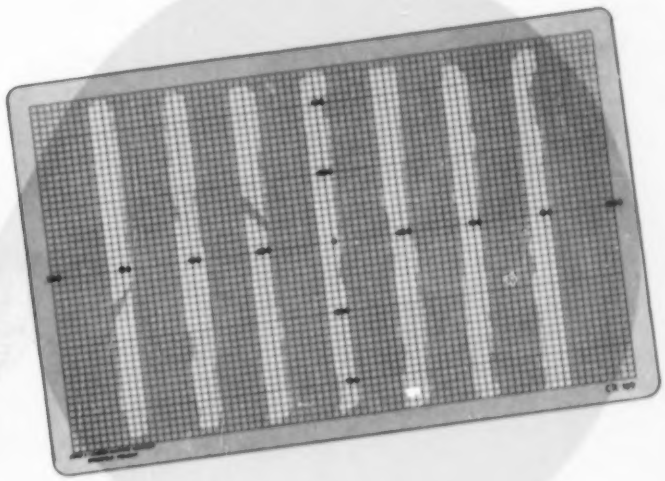

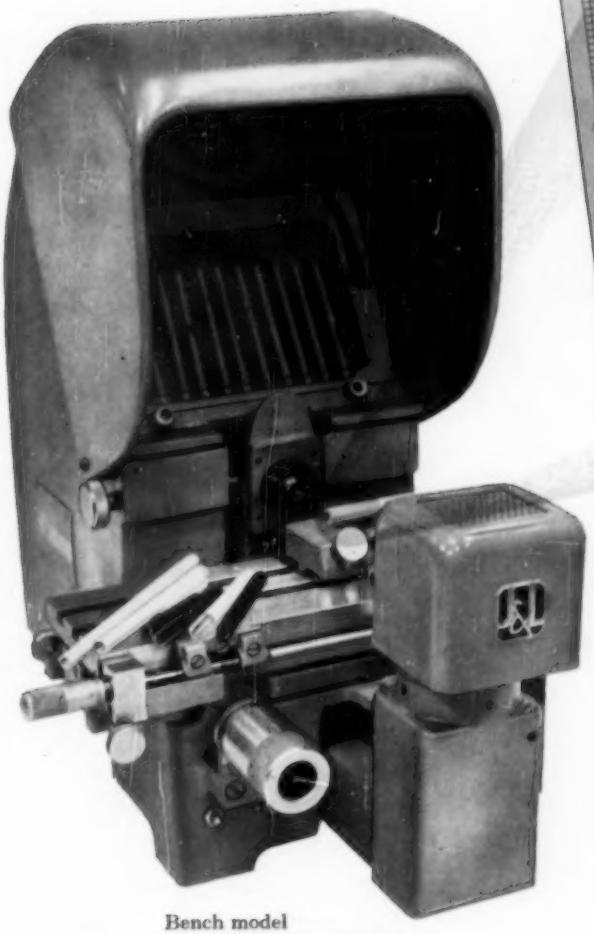

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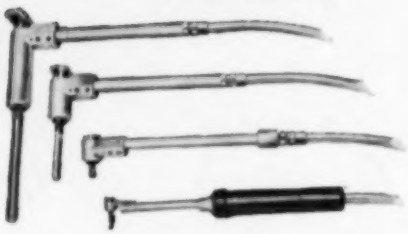

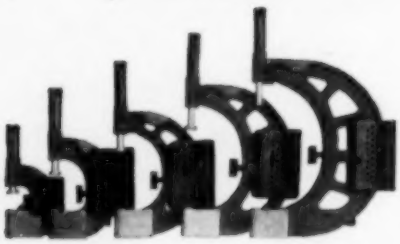

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